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DESIGN FOR BASCULE BRIDGE OVER RIVER THAMES BELOW LONDON BRIDGE. [See page 36.]

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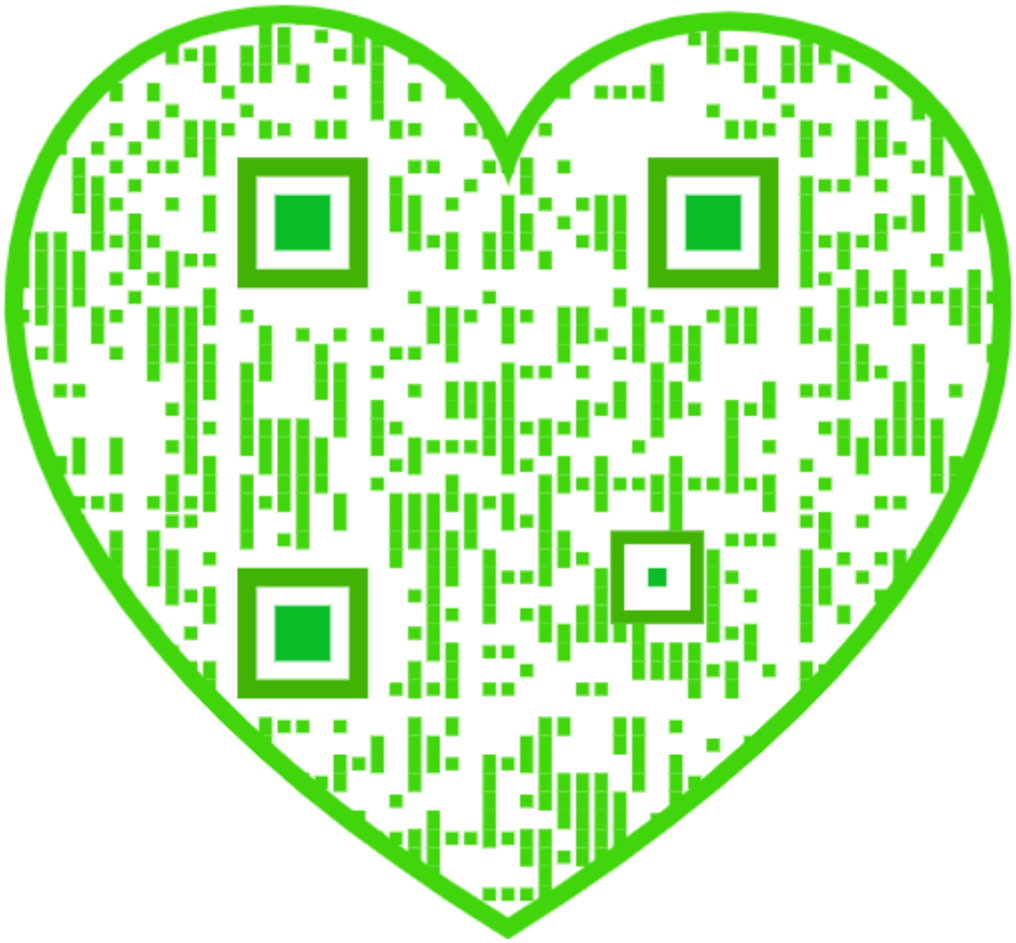

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NEW YORK, SATURDAY, JULY 21, 1883.

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POISONED BY HANDLING HIDES.

In New York city, a short time ago, a man died from poison, communicated while handling some buffalo hides sent from India. His companion worker employed on the same job was taken sick, and after a severe illness finally recovered. Both the men became warm, perspired freely, and repeatedly wiped the sweat from their faces with the bare hand, each of the men having a pimple on the face. Whether the death of the one and the illness of the other was caused by the virus from the hide of a diseased animal, or by the absorption of arsenic used in the preservation of the hides, is not positively known. Probably, however, the cause was disease communicated from an infected animal through its hide, as the Calcutta packers use, frequently, an arsenical preparation on the hides to kill a small brown worm that otherwise might destroy the hides, and instances of poisoning in handling these hides are not uncommon.

Some years ago an importer of hides in New York died from the effects of a bite or sting of a fly which inhabited the loft where the hides were stored.

SPONTANEOUS COMBUSTION.

With all the facts to show the possibility of the spontaneous ignition of certain substances under certain circumstances, there is a perpetually renewed demand for more information. So it is well enough to cite instances of fires caused by spontaneous combustion, even although it may be that "line upon line, precept upon precept" should be the rule.

A pile of cloth—cotton—left in a heap just as it came from the loom, and probably more or less saturated with oil, blazed up and fired a building in which there never was a fire or light before. This fire was probably caused by the piling of cotton cloth in heaps, the fibers of the cotton being saturated with oil—in this instance sperm oil, the only lubricating oil then in use.

A stone warehouse filled with cotton and woolen waste took fire on a summer afternoon, and resulted in the destruction of several buildings. In this case the waste, filled with oil, was packed closely in bins, or compressed into bags for convenience of stowing. Evidently compression, or weight, was an element in this case of spontaneous combustion.

A large establishment for the manufacture of machinery was burned by being fired from a heap of iron turnings thrown out from a convenient window, the greasy cotton cleaning waste being intermixed. It is hardly necessary, however, to have the element of greasy cotton waste in order to produce, or to communicate, fire from a heap of iron turnings, chippings, and filings. The mass of disintegrated iron and its contained oil are enough to incite heat and combustion. And careful observers can sometimes see, in the dark, the blue luminous shivers of flame over a heap of iron drillings, chips, shavings, and filings, adjacent to machine shops.

One of the finest blocks of buildings in an eastern city was destroyed, just before being ready for occupancy, by a fire started in an unused closet in which painters had thrown their overalls, these garments being presumably loaded with linseed oil and turpentine.

To these instances may be added some which were recently cited in *Chambers's Journal*. One of them dates back to 1780, when a Russian naval vessel took fire, and no cause except that of spontaneous combustion could be found or surmised. The fire was traced to a package of matting containing lampblack made from the smoke of fir and hemp oil varnish. A carefully observed experiment demonstrated the fact that a closely bound parcel of this mixture of lampblack and oil took fire within seventeen hours.

Wool-combings, packed in a warehouse in bins and trodden down hard by the workmen, set fire to the building. The wool was saturated with oil, or was, at least, oily, and the compression was probably one of the elements to spontaneous ignition.

Oily hemp and flax, in bales and heaps, took fire spontaneously in Plymouth dockyard and caused great destruction of property. In 1861 or 1862 there was a great fire in the Liverpool dock warehouses, caused, as far as could be ascertained, by the spontaneous ignition of wet cotton in bales.

The naval ships Imogene and Talavera were burned in Devonport dockyard by the spontaneous combustion of oakum and tow that had been used as waste for wiping greasy tools and machinery, and thrown into a bin.

Experiments prove that cotton waste wet in boiled linseed oil, placed under a temperature of 170° F., took fire in one hour and a quarter. Raw linseed oil on cotton required four or five hours under similar preliminaries; olive oil, six hours; rape oil, ten hours; and castor oil, two days. As to animal oils, lard oil with the cotton produced ignition in four hours; seal oil, in one hour and twenty minutes; and sperm oil—probably adulterated with petroleum—did not fire in two days. It is generally conceded that the mineral oils, of whatever specific gravity or constituent characteristics, are not liable to aid in spontaneous combustion.

But there are other causes of spontaneous combustion not usually considered, and yet established as facts by experiments and observation. Grain, either in the kernel or the straw, if packed into bins or piled into stacks while damp or only partially cured, will sometimes generate heat enough to cause combustion. Some of the supposed incendiary fires, by which barns have been burned, have been traced to this cause of spontaneous ignition; and in some other instances only that supposition was left as a reason for the fire. One case can be quoted as characteristic. It is taken from the *Annales d'Hygiène:* A quantity of oats stored in a barn had been consumed by fire, and the proprietor suspected the act to be one of incendiarism. Several experts were consulted; and on inquiring into all the circumstances, they unanimously concluded that the fire was the result of spontaneous combustion, caused by the fermentation of the grain stored in a damp state. Several things pointed unmistakably to this conclusion, such as the fact that the oats were proved to have been stored damp; that laborers had noticed the heat of the oats several days previous to the fire; that some of the sheaves that had been removed the day previous to the fire to be thrashed were charred and discolored; and above all, that the center of a large pile of sheaves was burnt and blackened, while the outside of the sheaves retained their natural color.

SCIENCE IN COLORING.

A London journal of high standing has inaugurated the criticism of paintings as viewed from a scientific standpoint—noting aspects which do not accord with the teachings of science and cannot, therefore, be in harmony with nature. It is impossible to make strict rules for the guidance of the artist in all cases, but he can be given rules, a wide deviation from which will produce discord, and the following of which will produce the grandest harmony. His own study and taste must guide him the rest of the way. It is also difficult to predict from what calling in life will come the best criticism. A rainbow painted with the order of the colors reversed will destroy the effect of the picture to the scientist; the milkmaid and the cow, with the maid on the wrong side of the cow, places that artist low in the estimation of the gazing farmer. The first violates nature, the second violates custom. That there is no excuse for such flagrant mistakes will be readily granted, but it is, perhaps, open to question as to which is the more to be censured. Each class (these two instances may be considered as types) shows lack of attentive study, or it may be that the first was so intent on the effect his rainbow would produce that he overlooked the correct coloring, while the outline of the maid and the cow so engrossed the second that he forgot that the position of the maid endangered the milk.

Scientific observation can be of great service to the artist, not so much in the arrangement of the subject as in the proper use of colors. In landscapes—in fact, in all attempts to portray outdoor scenes—it will enable him to name the colors which will not violate natural laws; he will properly arrange them, and he will do this by infallible laws. In the treatment of sky give him the conditions, and the scientific artist will name the colors so as to yield the most pleasing effect, for the simple reason that he knows those particular colors could be produced in the great laboratory, and he also knows that a promiscuous grouping would create dissatisfaction even to the uneducated eye.

THE LATHE.

The oldest machine tool known is the most valuable. It contains the germs of all others, whether rotary or reciprocating, and can be made to take the place and do the work of any one of them at a time, and all of them as desired. Its origin is lost in the mist of prehistoric times. It is as old as the loom, and was used by the oldest nations. As constructed in these times, it has reached great perfection, and is made in various special forms; there are boring and chucking lathes, turning lathes, screw cutting lathes, drilling lathes, and polishing lathes. But a screw cutting lathe with rack or friction feed, and the other ordinary appliances of a complete lathe, comprehends in its capabilities almost all the offices of the other special tools used in the machine shop.

Take a single instance of its capabilities, the production of a screw tap. The lathe will cut a piece from the steel bar; it will drill its centers and countersink them; turn the tap, whether straight or taper; cut the thread on it; score the tap, either by a cutter in the tool post while the tap is suspended on the centers of the spindles, or by means of a rotary cutter or milling tool on the spindle centers while the tap is held on temporary centers on the tool carriage. Even the top end of the tap can be squared, by similar means, for the reception of the tap wrench.

Now, all this work represents the cutting-off machine, the drilling lathe, the turning lathe, the screw cutting lathe, the planer, or the milling machine. And unlike many combination tools, the lathe can be made to do all this work well.

With a cheap attachment the lathe can be made to cut gears, making the teeth with practical accuracy, and the lathe itself can be used to produce the index plate that insures this accuracy. A job of planing—or surfacing—where the work will swing in the lathe, can frequently be better and quicker done on the lathe chuck than on the planer platen. The rapidity is much greater because the surface to be worked is continually under the action of the tool, instead of having more than one-third of the time wasted in the running back of the platen for the return chip.

In short, all the other machine tools, either of a rotary or reciprocating character, are simply modifications of the lathe; and with the lathe and its convenient appliances and necessary tools, the mechanic can by the exercise of his taste and skill perform almost any ordinary job in the working of metals possible on machine tools. The possession of a screw-cutting slide-rest foot lathe and a common bench vise, with their accompanying hand tools, is an excellent outfit for the amateur.

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STORING THE POWER OF THE WIND.

Treating recently of the possibility of utilizing the wind power which now so constantly goes to waste everywhere about us, mention was made of two means for accomplishing the object—electrical storage batteries and reservoirs for compressed air. It is worth while to state that the article was written with the full conviction, and for the purpose of bringing presently to fair understanding the fact that neither of these will do the work, and to urge inventors and active minds to work out the problem by which something better may become available.

What storage batteries may eventually be brought to do, is entirely uncertain. The whole subject of the actual management of electricity, so that it shall be an agent for mechanical uses, safe, trustworthy, and *cheap*, is yet so little understood that though we have great hopes for the future, our use of it at the present is subject to much difficulty.

As to storage batteries, in any of the various forms in which they have been made, and bearing the names of different inventors, it is but fair to remember that the accounts which have been published have been chiefly those put forth by interested parties, those who had pecuniary interests involved; and without imputing any intentional deception, it is easy to understand that such statements may go further than practical working will warrant.

The batteries are in truth of small real value. No man would dare to depend on them as a means of carrying on work whose success required a steady and even power. In the first place, they are very wasteful, for the claims made of the great percentage of power recovered from them are certainly not borne out, when they are subjected to fair investigation by those who have no object in proving their great excellence It is not too much to say, in general terms, that very nearly *half* the power transmitted to them is not recovered.

Then, again, trials seem to indicate that their life is short. The constant chemical action disintegrates the plates so rapidly that very frequent renewal is necessary. This, it is true, may not be very expensive, but it is very troublesome. And it is evident that until, or unless, they can be greatly changed and improved they will not do what we need in this case.

The other mode suggested was the use of reservoirs. The only difficulty here is the expense of the plant; expense involving also bulk. To illustrate the matter we will assume the case of a manufacturer employing for his daily work a twenty horse power engine. This he uses ten hours daily for six days, and it would be disastrous to his business to have this power fail him for even an hour. The wind power is so far unsteady that unless he could retain in his reservoir the means of running his engine two consecutive days at least, it would not be prudent for him to depend upon it; he might find his works lying idle for lack of power. That amount of advanced storage would, it is true, seldom be necessary. For a large part of the year he would not need ten, or five, or perhaps even two hours in advance; still he must be *safe*, and in order to be so he must meet the extreme want. A reservoir to contain a store of air compressed to such an extent as would be practicable to run his engine twenty hours must measure at least 30,000 cubic feet. Five cylinders of sixteen feet diameter and an equal length would approximately make it.

With these reservoirs his factory could go on in the future without expense for power; there would be the interest on the original outlay, and the cost of wear and tear; nothing more. The plant and the bulk are, as indicated, the difficulty. In some cases it may not stand in the way, but generally and especially for heavy power they amount to a real prohibition. We need something better, and we return to the original question: Who will devise the means of storing wind power?

It surely ought not to be given up as a matter beyond our reach. The means of running machinery to an extent practically unlimited are immediately ready to our hand when this one thing can be obtained. A.

The Medicaments of Brutes.

In a communication to the Biological Society of London, recently sent by M. Delaunay, on the medical practice of animals, the doctor gave some interesting facts, from which he argued that the human reason ought to be trusted as much as animal instinct in many instances where medical science seems to be at fault; and he insists that the desire of sick persons for certain foods and drinks may be a natural instinct rather than a morbid fancy.

But he does not state how the one may not be mistaken for the other. In his list of examples of medical instinct in the lower animals, M. Delaunay says that animals bathe for cleanliness and health, that they get rid of their parasites by using dust, mud, clay, etc. Those suffering from fever restrict their diet, keep quiet, seek darkness and airy places, drink water, and sometimes plunge into it.

When a dog has lost his appetite, it eats that species of grass known as dog's grass (*dogtooth*), which acts as emetic and purgative. Cats also eat grass. Sheep and cows, when ill, seek out certain herbs. An animal suffering from chronic rheumatism always keeps, as far as possible, in the sun. If a chimpanzee be wounded, it stops the bleeding by placing its hand on the wound, or dressing it with leaves and grass. When an animal has a wounded leg or arm hanging on, it completes the amputation by means of its teeth. A dog, on being stung in the muzzle by a viper, was observed to plunge its head repeatedly for several days into running water. This animal eventually recovered.

A sporting dog was run over by a carriage; during three weeks in winter it remained lying in a brook, where its feed was taken it. The animal eventually recovered. A terrier hurt its right eye; it remained lying under a counter, avoiding light and heat, although it habitually kept close to the fire. It adopted a general treatment, rest and abstinence from food.

The local treatment consisted in licking the upper surface of the paw, which it applied to the wounded eye, again licking the paw when it became dry.

The doctor thinks that veterinary medicine, and perhaps human medicine, can gather from these facts useful indications, precisely because they are prompted by instinct.

Manufactures of the United States.

The Census of 1880 makes the following showing:

Industries.	Hands employed.	Wages paid.	No. estabs.
Iron and steel	306.958	$128,787,924	6,498
Lumber and wood	244,926	79,843,837	38,090
Cotton and mixed textiles	228,845	58 931,172	1,475
Men's and women's clothing	185,945	52,541,358	6,728
Woolen goods	169,897	49.259,324	3,390
Boots and shoes	128.635	52,252,127	18,390
Carriages and smithing	104,718	38,185,271	43,122
Tobacco, etc	87.587	25,054,457	7,674
Brick, tile, etc	67.203	13,764.723	5.697
Furniture and upholstery	64,127	25,571.831	6,087
Leather, harness, etc	63,136	25,081,913	13,708
Printing and publishing	62,800	32,838,959	3,634
Flour and grist mill products	58,401	17,422,316	24,338
Agricultural implements	39,580	15,359,610	1,943
Shipbuilding	21,341	12,713,813	2,188
Total	1,844,102	$627,708,634	182,935

The total number of hands employed in all the industries in the census year (1880) was 2,738,859; the aggregate of wages paid was $947,953,795, and total number of establishments is given at 253,852. The statistics of iron and steel manufactures include blast furnaces, bloomeries, forges, rolling mills, steel works, forge products, machinery, and finished and ornamental iron work of all kinds; of lumber, sawed, planed, turned, carved, sash, doors, and blinds; brick and tile include drain pipe and terra cotta statistics, and printing and publishing incorporates lithographing. The following table exhibits the leading industries in order of annual value of products:

Industries.	Value annual products.	Value materials used.	Total capital.
Iron and steel	$551,543,109	$319,594,960	$405,636,070
Flour and grist mill products	505,185,712	441,545,225	177,361,878
Lumber and wood	407,615,968	245,986,332	242,248.783
Cotton and mixed textiles	277,172,086	150,993,278	259,500,851
Woolen goods	271,916,746	166,640,753	160,798.466
Men's and women's clothing	241,553,254	150,922,509	88,068,969
Leather, harness, etc	241,056,230	177,821,175	91,310,030
Boots and shoes	207.387,903	122,542.745	56,548,665
Carriages and smithing	139.410,873	57,522,275	76.038,143
Tobaccos, etc	118,670,166	65,384,407	39,995,292
Printing and publishing	97,701,679	35,216,159	67,485.529
Furniture and upholstery	85,004,618	40.005,090	47,231.529
Agricultural implements	68,640,486	31,531,170	62,109,668
Shipbuilding	36,800,327	19,736,258	20,979,874
Brick, tile, etc	33,868,131	10,119,538	28,659.329
Total	$3 284,527,288	$2,035,561,974	$1,821,973,976

The total value of products of all industries reported by the census was $5,369,579,191; the value of materials used was $3,396,823,549; and the total capital was $2,790,272,605. It will, therefore, be observed that the totals of the industries in the second table are approximately two-thirds of the grand totals named. A general inspection of both tables confirms what we have hitherto stated, that there is about $1 000 of capital invested in manufacturing and mechanical industries to every employe. Thus it appears that for every person employed in those industries, the interest on $1,000 must be provided for in making an estimate of the cost of production.

It will be noticed that, while the aggregate capital of all industries is $2,790,272,605, the total number of employes is 2,738,895. In the fifteen lines of industry mentioned above, there are 1,844, 102 employes accounted for, and the total capital engaged by the industries given is $1,821,973,-976. Another striking coincidence is that the average amount of capital employed by the 182,935 establishments represented in the above fifteen lines of industry is just about $10,000 each.

Improvements in Photographic Emulsions.

The processes by which Dr. H. W. Vogel, of Berlin, carries out his improvements in the preparation of emulsion are said to entirely avoid the disadvantages of the ordinary aqueous bromide of silver gelatine emulsions. The process has been fully protected by letters patent in this country and elsewhere. The essential feature of Dr. Vogel's invention is the use of gelatine combined with pyroxyline into a homogeneous fluid, which, it is stated, was unknown until he discovered a suitable solvent, which he finds among the inferior members of the fatty acids, *e. g.*, formic, acetic, propionic acid, etc., their derivatives, and mixtures of the same. Dr. Vogel gives the following four methods, which he has found successful:

1. I first produce a gelatine emulsion according to the customary process, which is then dried by means of cold or warm air, or other means for extracting the water. This dry bromide of silver gelatine (which can also contain iodide of silver and chloride of silver) I then dissolve warm in one of the above mentioned acids, using three to ten times as much or even more acid. The quantity of acid to be used depends on the solvency of the gelatine, and must be tried for each kind. This acidulous emulsion is now used alone after having been diluted with alcohol to the required consistency, or can be mixed with pyroxyline. The pyroxyline is dissolved in acetic acid, a like acid, or a mixture of such acid with alcohol. The most appropriate quantity of pyroxyline is about one per cent of the quantity of acidulous emulsion employed.

2. Pyroxyline is dissolved in one of the fatty acids—for instance, formic acid or acetic acid, or a mixture of such acids *per se*, or with alcohol or other solvent which will dissolve both gelatine and pyroxyline. For easily soluble pyroxyline, alcohol or methylated spirit, or a mixture of the same, can be used as solvent. The proportions can be varied in many different ways, so that the following formula serves simply as an example:

Pyroxyline	2 grammes.
Acetic acid	50 "
Alcohol	50 "

The collodion produced by this process is mixed with about an equal quantity of acidulous emulsion, as above described. The gelatine emulsion collodion produced can be slightly warmed and applied like ordinary collodion to glass plates, paper, etc., and exposed to the light either in a moist or dry condition.

3. A collodion emulsion is prepared according to the customary formula and precipitated as usual by water; or the emulsion is allowed to dry up, then washed, and the dry matter dissolved in one of the above mentioned acids or mixtures of the same with alcohol. Gelatine, either alone or after being dissolved in one of the solvents mentioned above, is now added to the collodion preparation. The proportions can be varied in the like degree as in the preparation of the ordinary collodion emulsion. The following is, for instance, one of the various proportions of the mixture: 7 grammes of the precipitated pyroxyline containing bromide of silver are dissolved in 150 grammes alcohol and 90 grammes acetic acid, then 2 grammes gelatine are dissolved in 20 grammes acetic acid and added to the same.

4. Dissolve gelatine and pyroxyline in one of the above-mentioned solvents, or dissolve them separately, and then mix the solutions. Finely powdered bromide of silver prepared in the customary manner, or any one of the silver haloid salts, or a mixture of the same, is now added to the gelatine collodion solution; or the silver haloid salts are produced in the gelatine collodion solution through double decomposition. These proportions can also be varied in different ways.

Storage Gas Battery.

An adaptation of Sir W. Grove's gas battery as an accumulator has been devised by Mr. F. J. Smith, who describes it in the *Philosophical Magazine* for March. To enable the battery to discharge for a considerable time, the gases are put under high pressure. One made in this way has been in use for the past eighteen months. It consists of a strong lead vessel well lined with rubber varnish to prevent any dissolution of the lead.

The plates are platinized platinum cylinders with wires and terminals running through the case in insulating sheaths. A manometer is attached to register the pressure; and a 10 per cent mixture of sulphuric acid and water is used to charge the bell. With this arrangement Mr. Smith easily obtains a pressure of seven atmospheres, and the platinum cylinders, one of which has twice the capacity of the other, can hold a proportionately larger quantity of gas than they would do at the ordinary pressure.

A second form has been constructed for the author by Messrs. Becker & Co. In this a U-shaped glass tube is employed, the manometer being attached to the bend, and sheets of platinum being fused into each leg. This form, although well suited for lecture purposes, only bears a small pressure. A curious observation is that the electro-motive force of the accumulator varies with the pressure of the gas.

In addition to constructing this battery Mr. Smith has charged small Faure or lead secondary batteries under pressure, and found that the time of discharge is longer when thus charged. Mr. Smith is at present engaged in studying this obscure phenomenon; and for the benefit of others engaged in similar inquiries he states that oxygen liberated by electrolytic action acts almost instantly on India-rubber tubing or varnish, and causes it to split and crack.

Condensed Skim Milk as a New Food.

According to the *Chemiker Zeitung*, M. Muller has evaporated skimmed milk in a vacuum, so as to obtain a permanent product, which can be preserved for many months in a dry atmosphere, and which has valuable alimentary properties. He thinks that it may be of great use in pastry, and in various kinds of baking, and the best sugar of milk can be made from it. The skimmed milk which is collected in dairies and cheese factories is usually given to animals or wasted in sewage; it contains, however, large quantities of salts and particles of butter and caseine, which can be utilized by Muller's method —*Rev. Scientif.*

ACCORDING to *Weidemann's Beiblatter*, a shark belonging to the genus *Scymnus* is phosphorescent on its whole under surface, with the exception of a black stripe on the neck The upper surface is non-luminous.

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IMPROVED FRUIT EVAPORATOR.

The annexed engraving represents a very simple and efficient fruit evaporator, recently patented by Mr. William H. Reed, of Cliffdale, Ill.

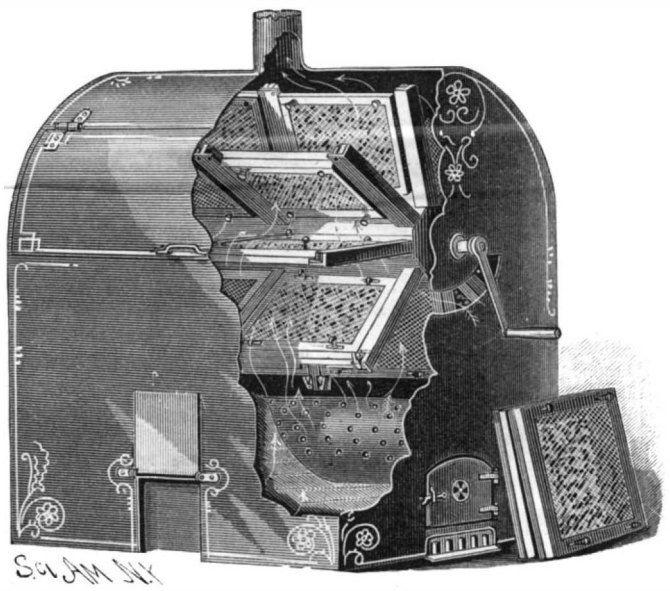
This apparatus consists of a reel adapted to receive in its double arms a series of fruit crates, the reel being supported on a shaft in a heating chamber, and rotated so as to bring the crates successively over the heater and to create a current of air which rapidly carries off the moisture from the fruit. The heating chamber is fitted with a ventilator at the top, and air inlets at the sides, about the shaft. The bottom of the furnace at the sides is filled in with fire resisting clay to carry the heat of the furnace directly up to the reel without great loss by radiation. There are air supply openings with dampers at the lower part of the heating chamber for supplying the amount of air required.

The chamber may be heated in various ways, either by a furnace, as shown in the engraving, or by means of a stove or by steam. The crates which fit into the radial arms are provided with wire gauze sides, so that the air has access to all sides of the fruit as it is carried around by the reel.

The capacity of this machine may be increased by extending the shaft and adding sections to the reel. In this case the sections are geared so that any one may be stopped or revolved without interfering with the others.

This evaporator is very rapid in its operation, and produces uniform evaporation without shifting the crates, and without special attention. The reel is revolved by suitable power or by hand.

Further information in regard to this invention may be obtained by addressing the inventor as above.



REED'S FRUIT EVAPORATOR.

To Detect Alcohol in Oils.

To detect alcohol in oils, take a slim glass tube eight or ten inches in length, closed at one end, and as large as your finger. Put in an ounce or two of oil, paste a piece of paper on the outside of the glass, so that its lower edge will be even with the top of the oil, then add two or three times as much soft water, and shake well for a few moments. When it has settled, in an hour or so, the water will have absorbed the alcohol from the oil, which will show proportionately below the line first fixed.

HERRINGTON'S SYSTEM OF TRANSPORTATION AND DELIVERY.

A ready means of transporting articles for short distances is shown in the engraving. The device is more particularly designed for receiving and delivering parcels of goods, groceries, provisions, milk, etc., but it may be used to great advantage in manufactories and in many other places. The apparatus is so simple as to scarcely need description, consisting of a carrier, a wire or cable upon which the carrier runs, and a device at each end of the wire or cable for raising and lowering it to secure the elevation necessary to cause the carrier to run along the wire or cable. At each end of the cable there is a catch which retains the carrier at the end until the opposite end of the wire is lowered, when the wire becoming taut disengages the latch and releases the *carrier*. The article to be transported or delivered is suspended from the carrier and is moved along the wire by its own gravity.

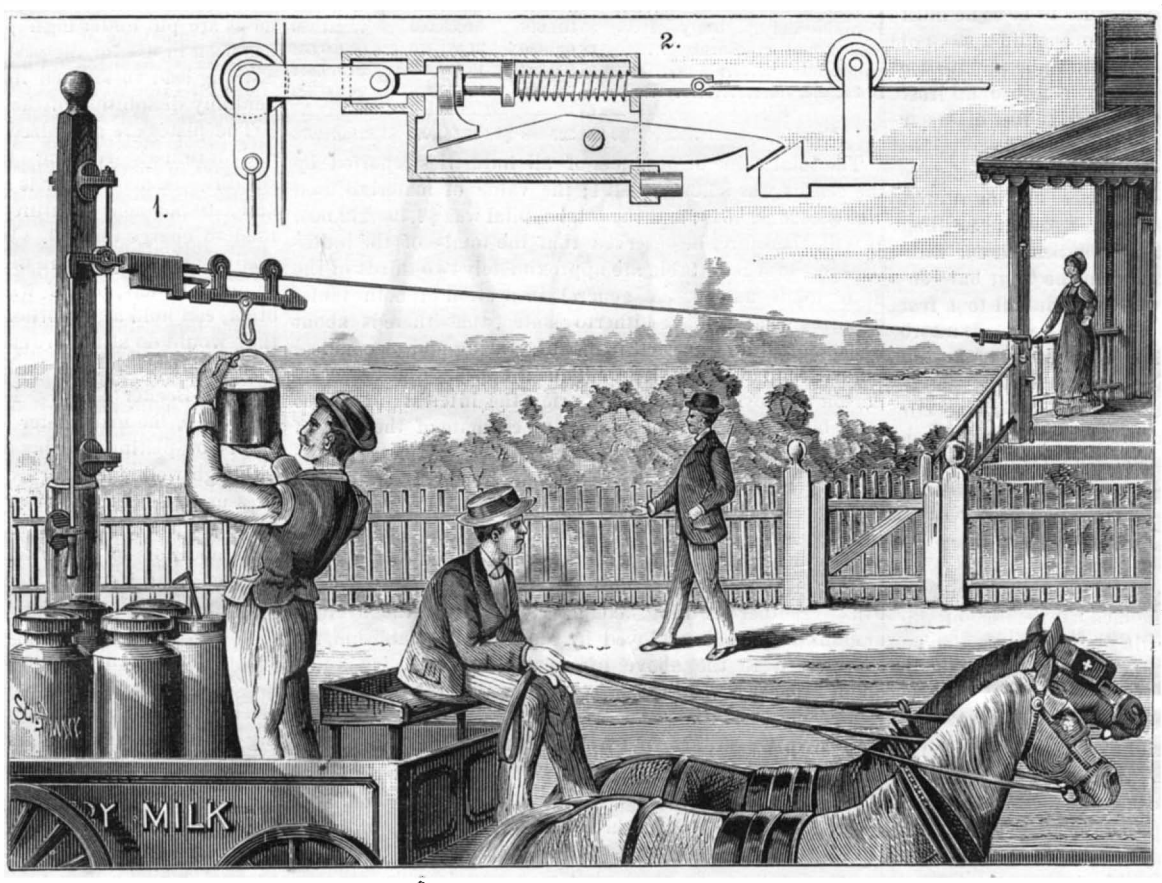
In the present case the article being delivered is milk. The can is suspended from a hook on the carrier, and when the street end of the wire is raised by means of the cord running over the pulley on the post, the carrier moves forward toward the house end, where it is arrested by a rubber buffer and is retained by the spring catch before referred to.

Fig. 2 shows the arrangement of the pulley, carrier, catch, and buffer.

If the person at the house desires to operate the carrier, the method is the same as that already described.

This device is very simple, easily constructed, and applicable to a great number of uses. It is capable of saving a great deal of labor, and may be profitably introduced in many places.

Mr. G. H. Herrington, of Wichita, Kas., is the patentee of this invention.



HERRINGTON'S SYSTEM OF TRANSPORTATION AND DELIVERY.

To prevent mould on the top of glasses of jelly lay a lump of paraffine on the top of the hot jelly, letting it melt and spread over it. No brandy paper and no other covering is necessary. If preferred, the paraffine can be melted and poured over after the jelly is cold.

Arago's Little Joke.

One day at the Academy of Sciences they had a long and tiresome session. Arago thought he would go out and take the air. At the foot of the stairway there was a leather bowl, upon which the rays of the sun were hotly beating. Arago turned the bowl round, and, rushing up stairs, told the distinguished assemblage that he had just met with something that was very mysterious. "That leather bowl," he said, "at the foot of the stairway is cool upon the side which presents itself to the sun, but warm upon the other side." The scientists descended in a body and substantiated this assertion. They took the inclination of the sun, the hour, the minute, the second, and a vast array of other details. They made calculations, and several weeks afterward each of them presented a paper explaining the phenomenon, Arago himself taking care to send in his explanation with the rest. There is no knowing how far the discussion might have gone had it not been for the doorkeeper, who, having seen Arago turn the bowl, and pitying the worthy gentlemen who were so much worried, cleared away the mystery.

Studies on Milk.

The author comes to the conclusion that human milk and cow's milk contain the identical albuminoids. Human milk contains, however, a smaller proportion of albuminoids, and especially of caseine. All the albuminoids held in solution in milk can be separated by dialysis (with chloroform water) from the undissolved caseine and from the butter. A part of the undissolved caseine forms the covers of the milk-globules, and is separated out in the cream; the other portion remains in the skim milk. The milk globules swell up if shaken with ether. The digestibility of any milk is inversely as the quantity of caseine which remains in the skim milk. Hence, Dr. Biedert's suggestion that only cream should be used for the earliest nourishment of young children brought up by hand is perfectly justified. The caseine of human milk, as well as of cow's milk, has always an acid reaction. In human milk there is only a small quantity of butter in a free state.—*H. Struve.*

Poisonous Effects of Petroleum Smoke.

A curious instance of poisoning from the smoke of petroleum is reported in the *Neue Freie Presse* of Vienna. A workingman's wife brought to a local hospital a child eighteen months old who had been seized early in the morning with violent convulsions, and had subsequently become unconscious. She also stated that her husband, on awakening, had been taken with cramps, and had an uneasy sensation in his upper and lower extremities, accompanied by headache, from which she was also suffering. The singular color of the child and the results of careful examination led to the conclusion that there had been acute poisoning from smoke gases. It was then discovered that in the small and ill-ventilated bedroom occupied by the parties in question a petroleum lamp was used as a night lamp, the flame being reduced as much as possible. The wick had, however, been left projecting without the protection of a glass cylinder. In this way the flame of course emitted smoke. The father (himself a delicate man) was also found to exhibit symptoms of poisoning. By the exertions of the medical men in charge of the cases, both the father and the child have progressed so far toward recovery that their restoration to health is confidently expected.—*Lancet.*

Frogs.

A Louisville (Ky.) scientist, according to the *Electric World*, sings the praises of the frog, and incidentally refers to the part the humble batrachian has played in the development of electrical science: "Even in the benighted age in which Galvani lived it had been discovered that frogs' legs were good to eat. He had a pair of them hanging on a copper hook, and occasionally the wind would blow them against an iron railing, and they would jerk convulsively whenever contact was established. Galvani noticed it, and set his wits to find out the cause. Everybody knows the history, although it is a long one, and everybody knows that from that simple occurrence, and through the defunct frog's instrumentality, we have the telegraph monopoly, the telephone, with the wires crossed half the time and the other half something the matter with the transmitter, the electric light, which doesn't burn on cloudy nights, and many other blessings of life. The world owes all those things to the simple fact that a frog's hind legs are good to eat."

Tobacco Insecticide.

The *Repertoire de Pharmacie* quotes, upon the authority of Dr. Nessler, a recipe for an insecticide which is said to have a great reputation among German horticulturists. It consists of soft soap, 4 parts; extract of tobacco, 6 parts; amylic alcohol, 5 parts; methylic alcohol, 20 parts; water to make 1,000 parts. The extract of tobacco is made by boiling together equal parts of roll tobacco and water for half an hour, adding water to make up for what is evaporated. The soft soap is first dissolved in the water with the aid of a gentle heat, and the other ingredients are then added. The mixture requires to be well stirred before it is used, and is applied by means of a brush or a garden syringe fitted with a small rose.

An American Example in Australia.

Frearson's Weekly, Adelaide, South Australia, gives several illustrations of railway viaducts, including the Kinzua viaduct on the Erie road, and in describing those on the Nairne line, Australia, says:

Many of our readers may not be aware that the viaducts on our Nairne line are modeled after the celebrated Kinzua viaduct. It is on the New York, Lake Erie, and Western Railroad, and is situated in the middle of McKean County, Pa., four miles from Alton, the present terminus of the Bradford branch of the Erie road, and crosses the Kinzua Creek at an elevation of 2,100 feet above sea level. It was Mr. O. W. Barnes, of New York, who two years ago proposed to cross the valley by an immense viaduct. He was at that time chief engineer of the Bradford branch of the Erie, and was ably aided by his energetic assistant, Mr. Charles Pudsley. The length of this structure is 2,051 feet clear of the abutments, the height 301 feet from the bed of the stream to the base of rail.

IT is asserted that the largest ivory factory in the world is at Centrebrook, Conn., where sometimes $125,000 worth of ivory is bleaching

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Additional Water Supply for New York City.

The governor having approved of the new water supply bill, the additional works will be proceeded with as fast as possible. At present the city is supplied from Croton River and Lake, distant 40 miles from the city, by a masonry aqueduct 7 feet in diameter and about forty miles long. The daily delivery is 100,000,000 of gallons, equal to about 75 gallons for each inhabitant. The waste is enormous.

The new water commission will be asked to adopt the Quaker Dam plan, which is to build four and one-half miles below the present Croton Lake a massive dam to span the valley, rising to the height of some 200 feet.

This dam will be constructed of masonry on bed rock, near Quaker Bridge, and raise the water level in Croton Valley to 200 feet above tide, with a storage capacity of about 32,000,000,000 gallons. This will receive the entire drainage of 361 square miles of watershed, and the estimated cost is $4,000,000. The reservoir will practically be a deep lake with an area of 3,655 acres. Added to the other sources of supply the storage capacity of the reservoirs would be about 46,000,000,000 gallons, and these would give very nearly 200,000,000 gallons per day for 230 days, independent of the natural flow of the Croton.

The line of the new aqueduct will measure 26½ miles to High Bridge. As far as practicable this will be built in tunnel, securing strength and avoiding expensive land damages. It will be circular, of brick, and the question is whether it shall be 12 or 15 feet in diameter. The latter will add 15 per cent to the cost, and yet increase the capacity nine-sixteenths.

The valleys will be crossed by masonry conduits, while siphons may be introduced for the Harlem River and Manhattan Valley. The water will be delivered into the reservoir at Central Park at an altitude of about 119 feet above tide water, leaving the Quaker Bridge reservoir at an elevation of 142 feet, thus allowing 58 feet of storage water to be drawn from, provided the new Croton Lake was filled to its utmost capacity.

The preliminary estimates are $4,000,000 for the storage reservoir, and $10,000,000 to $12,000,000 for the aqueduct. But these figures only include the delivery of water at High Bridge, and do not take into account the land damages or other injuries occasioned by the passage of an aqueduct with an internal diameter of 15 feet, nor the expenses occasioned by legal delays, etc.

The Electric Wonders of the Age.

Hon. S. S. Cox, in the annual address delivered before the Indiana Asbury University, at Greencastle, on the 19th ult. said:

"The electric monograph transmits messages in the original handwriting. The hektograph multiplies your epistles; the telephone enables people to make contracts through an orifice; but as there is no witness, photography comes in and records the shadow of the sound by curves in vowels and consonants!

"Electricity is an element elusive and subtle, yet it is stored in a box and imprisoned in a metal to be used at pleasure for portraiture, sound, light, or power. I have seen an organ in Berlin played by electricity, but this is simple compared with other experiments. Is it not a marvel that we can telegraph from a moving railroad car or the speeding steamship? A California photographer obtains six photographs in one leap of a clown in six different positions. He catches a horse on the galop, a rabbit on a run, and a bird on the wing. By means of a wire a circular saw or a locomotive may be—nay, has been—run miles distant from its source of force. Electricity is born of the sun. It may be converted back to its source, so that when one talks by telephone he may see his distant colloquist. It is shrewdly believed that nerve power depends for increased strength on light. It will not be strange if the polyscope illuminates the animal organism, rendering the body transparent. The vast current of liquid force which we call electricity is condensed in boxes like desiccated meats, or spread over continents to convey intelligence. Man can never overdraw from this vast, bankruptless depository of nature.

Products from Telegraph Batteries.

Of the 12,350*l.* spent during the year 1881–82 upon the 127,166 galvanic cells in use, 2,727*l.*, or about 22 per cent, were recovered by the sale of the battery residues, consisting of copper, zinc, and lead salts. It has been customary to sell these products by auction twice a year. The Government does not guarantee any fixed percentage of metal in these salts, but the amount varies very slightly. The normal cell of the German telegraph offices is a modified Daniell cell of a simple and cheap kind. The zinc electrode is formed of a ring, hanging down from the edge of a glass vessel to half its depth. On the bottom lies a rectangular plate of lead, to which a vertical stout iron wire, incased in sheet lead, is soldered, making the other electrode.

The glass is filled with sulphate of zinc solution, and a few crystals of sulphate of copper are from time to time dropped into the liquid. Of these materials the zinc ring is of course most subject to deterioration. Thus we find that the above mentioned 127,166 cells required nearly 80,000 new zinc rings, against 7,300 lead sheets and 910 lead plates. The sulphate of copper forms the largest item in the annual expenditure, amounting to 8,000*l.* During the four years which the table comprises, from 1878 to 1882, the number of cells had increased by nearly 20,000.

NEW CIGARETTE MACHINE.

The engraving below represents a new cigarette machine, invented by Dr. E. Casgrain, of Quebec, Canada, and patented by him in the United States, Canada, England, France, Spain and Cuba, and Germany. It consists of 2 cylinders joined by a band, journaled in frames hinged to each other, one of which is provided with a crank handle, and the other furnished with an internal tension spring. To-

SIMPLE CIGARETTE MACHINE.

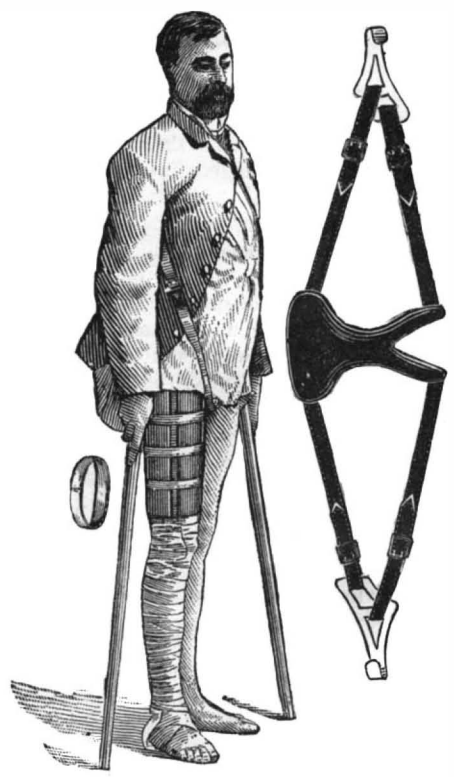
bacco and paper are placed on the band, the machine is closed, a turn of the crank handle enrolls the tobacco, and the cigarette is made.

The machine works perfectly and easily and is very well designed and arranged. An inexperienced hand may make over 100 cigarettes an hour with it. It is a great improvement in inventions of the kind, working very rapidly, and it is withal cheap and practical.

M. M. Gaynor & Fitzgerald, of New Haven, Conn., are sole manufacturers for the proprietor.

A NEW CRUTCH.

Doctor James R. Taylor, of New York city, while reading a paper before the American Medical Association, at its recent meeting at Cleveland, on "Fractures of the Long



TAYLOR'S IMPROVED CRUTCH.

Bones," exhibited a novel device of his own invention, for use in combination with the ordinary crutches used by convalescents from fractures of the leg, or other cause of lameness of the lower extremities.

The invention consists of a neat little saddle, which is well shown in the accompanying engraving, and it is so arranged that it can be worn without inconvenience inside of the clothing. Attached to it are a pair of small adjustable suspenders, the free ends of which terminate in steel hooks for fitting upon the tops of the crutches.

When the suspenders are adjusted to fit the patient, the hooks reach up to about two inches below the axillæ, the ends alone coming out under the arms and outside of the clothing.

These ends are the only parts of the device which are visible.

The saddle is well padded to fit the perineum, and is of such form that the patient rests upon it without discomfort when sitting on a chair. Its temporary removal is also nicely provided for, and when the wearer places the crutches in the suspender hooks for the purpose of walking, the weight of his body is carried entirely upon the saddle, without the crutches reaching up to the axillæ, so that no discomfort is experienced even in taking long walks.

The apparatus was received very favorably, and cordially applauded by the large body of surgeons present at the above meeting.

This apparatus has been thoroughly tested by Doctor Taylor on quite a number of his own patients, both male and female, with great satisfaction to both the patient and the doctor.

The Air of Houses.

There is much confusion in the minds of some people, says the *Building News* (London), with respect to the dryness or dampness of houses. An airtight room is more or less damp, though people are generally apt to think it otherwise if there is no draught, and all the air is carefully shut out. As a general rule, we invariably find the most draughty house is the driest, as it will be generally found to be the healthiest, if not the most comfortable, in cold weather. But the air of a room, as that for an invalid, may become too dry; it may be overheated by a stove, which would become injurious to the patient. In certain cases vaporizers are now employed to give the air of the sick chamber its healthful proportion of moisture.

Mr. G. J. Symons, in a paper on meteorology, has remarked that the subject of the hygrometry of the sick room was unknown two generations ago. If, in addition to temperature, the quantity of moisture in a sick room were indicated by the hygrometer, a great deal more might be done for the invalid's comfort. It is just as easy to regulate the hygrometric condition of the sick room as its temperature, and, in many respiratory complaints, the former is even of greater importance than the latter. The hotter the air is the more water can it contain, and this condition does not appear to be apprehended by those who dwell in such rooms, or provide the means of heating and ventilating them.

Prof. Tyndall found that the moisture in the air of an ordinary room absorbs 50 to 70 times as much of the radiant heat as the air does. Moisture is the regulator and conservator of the heat, and in due quantity acts like a blanket, by protecting us from a too sudden cooling or heating. The question is one, we think, worthy more attention by the sanitary builder than has been given to it. Complaints are loud against certain hot air furnaces, as they overheat the air and render it unfit for breathing; they tend to scorch and dry the air, and to this extent they are unhealthy.

Hydrophobia.

For some time M. Pasteur, the French investigator, has been experimenting with a view of discovering whether the fatal infection of rabies can be disarmed of its power by inoculation. It is said that he now possesses four dogs which are proof against the infection, whatever may be the method of inoculation used or the virulence of the matter, while other dogs inoculated with the same virus invariably perish. The experimenter raises the question whether these four animals owe their impunity to spontaneous recovery from a mild attack, which may have escaped observation, or whether they are naturally refractory to the disease. One of the three dogs which he inoculated in 1881 survived, and though twice inoculated in 1882, he did not become rabid. The importance of finding a remedy for all forms of hydrophobia is magnified by two facts brought to light by the researches of M. Bert. One of these is that even if the saliva of a mad dog does not communicate rabies it may prove fatal by producing serious local injuries—in other words, the secretions of rabid animals have poisonous properties over and above the special rabic virus. The second fact is that it does not follow because a dog which has bitten any person does not die, that the animal is free from rabies. These conclusions will add to the terrors of the disease. But there is some consolation in learning from M. Bert that the mere salivas of rabid dogs do not always communicate the deadly virus, and apparently never communicate it unless they contain the mucus from the respiratory organs, which seems to be the fatal portion of the saliva.

Origin of Yellow Fever.

A report has been received at the State Department, at Washington, containing the results of observations and experiments made by Dr. Freize, a Brazilian physician, who believes that he has discovered the cause of yellow fever in a microscopic parasite found in the blood of yellow fever patients. Experiments made by injecting this infected blood into the veins of rabbits and guinea pigs proved its virulence by producing death, the blood of the inoculated animal showing the same characteristics as that from the original yellow fever victim. The doctor's experiments seem to prove, also, that these parasitic germs of death survive in the soil where the subject of the fever is buried, and from thence may again contaminate living organisms, which would appear to favor cremation rather than burial in the case of yellow fever victims.

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PROPOSED NEW BRIDGE, LONDON.

It is recorded that when James I. threatened to punish the citizens of London by the removal of himself and his court to some other city, the Lord Mayor calmly informed the King of the hope of the citizens that His Majesty would leave them the Thames. So long as the river remained, the people of London believed that they might endure the loss of even the Solomon of the West. Since that time much has been done by means of railways and improved roads to facilitate the intercourse of nations and to promote commerce; but the Thames is still what it was in the days of King James, the link by which London is united with the rest of the world. If, as Sir John Herschel says, "London is the center of the terrene globe," that position is due to the possession of a navigable channel. What other city can show such a proof of international trade as may be witnessed every day in the year between London Bridge and Blackwall?

The supremacy of London in commerce is in a great measure attributed to the navigability of the river, and in dealing with the Thames this fact should never be overlooked. While every one admits the advantage of unimpeded communication between the parts of the metropolis on both sides of the river, it should also be remembered that an advantage of the kind would be dearly purchased if to secure it impediments were raised to interrupt the traffic on the water. The local requirements of Whitechapel and Bermondsey should never be allowed to override the general interest of the city (which is also the interest of England), and although it would be well for carts from Shoreditch to reach the Old Kent Road expeditiously, the gain in time would hardly compensate for the loss that is inevitable if commercial arrangements which have taken centuries to mature should be disturbed or destroyed.

When, for example, it is proposed to erect a bridge with a massive pier in the very middle of the waterway, or a bridge of a height that will prevent many of the vessels that trade with London from passing under it, or a bridge on so ingenious a principle that there is risk of the intricate machinery becoming disarranged in the opening or closing, it is evident that in every one of those cases there is a certainty of interference with the traffic of the Thames, and the trade of the port will in consequence be sacrificed to local interests. On the other hand, a fixed bridge at a high elevation above the river would involve local inconvenience, for it must be costly, and unless the approaches are carried for a great distance inward, the gradients will be steep and involve a loss of tractive power.

If the foregoing assumptions are correct, it is evident that the question of constructing a bridge over the Thames below London Bridge is one in which compromise is demanded if there is to be a satisfactory solution. Something must be abated by all parties, by the representatives of land traffic as well as by the riverside proprietors. It is physically impossible to have a bridge with easy gradients for land traffic, and which will be also clear above the highest masts, or one on a low level which shall still be equally convenient for ships and wagons; and the most prudent course will be to construct a bridge on a principle that will give a minimum of inconvenience, while allowing of easy gradients and a capacious waterway. In the opinion of the special committee of the London Corporation, who were appointed to investigate this question, the design which is illustrated by us this week complied with those conditions. The committee reported that the design commended itself to them "as one providing a bridge which would interfere but very slightly with the river traffic, and would bring about that relief to the commerce and trade of this city contemplated by the references to your committee."

It will be seen from the illustrations that the City Architect has adopted the bascule principle for his bridge, as being simple in arrangement, economical, and convenient, besides admitting of that architectural effect in the towers which is necessary for a structure placed in so important a position. In the upper view the bridge is open, and in the lower one closed.

The proposed bridge, having in its center the same height of waterway as London Bridge, viz., 29 feet, would consist of two side spans of 190 feet each, and a center span or opening of 3 0 feet. The roadway of side spans would be carried by two wrought iron lattice girders, of ordinary type, or by shallow lattice girders carried by suspension chains from the towers, with girders spaced 35 feet apart, and cross girders between carrying buckled plates on which the railway would be bedded.

The center span of 300 feet would be bridged by two hinged platforms, forming the "bascule." The longitudinal and cross girders and buckled plates of the platforms are all proposed to be steel, to reduce the weight as much as possible. Each platform would be suspended by eight pitched chains, passing over polygonal barrels fixed in the semicircular arches between the towers, and from thence to the hoisting machinery in the towers, where they would terminate in a plain chain or iron rod carrying the balance weights.

The hoisting machinery could be worked by steam power, or by hydraulic apparatus, supplied by tanks fixed in the roof of the towers.

The arches between the towers carrying the polygonal chain barrels would be formed of four wrought-iron braced semicircular arched ribs, connected transversely by four wrought-iron lattice frames. The rise of each arch in center would be 130 feet above Thames high-water mark, or of 100 feet headway for a width of at least 150 feet.

The principal advantages of the design proposed are:

First. Lowness of level and, consequently, *easy gradients for the land traffic.*

Second. *Economy of construction* in the approaches on both banks of the river, the lowness of the level allowing of direct access, and necessitating very slight alterations of the adjoining streets and properties.

Third. Occupation of less river space than a swing bridge, which, when swung open, requires a clear space equal to the half span of the bridge.

Fourth. *Less interference with the tide-way* or navigation of the river, there being only two towers or piers, instead of three or four, as in the swing bridge schemes.

Fifth. *Beauty of form.* The chief features of the bridge being capable of architectural treatment, it might be rendered the most picturesque bridge on the river.

Sixth. *Facility and rapidity of working* by the special arrangements of machinery proposed. For instance, a ship signaled at a quarter of a mile distant, and sailing or steaming at the rate of, say, six or seven miles an hour, could pass through the bridge and the land traffic be resumed in three minutes; or if half a dozen vessels were within half a mile of the bridge, all could pass in five and a half minutes.

It has been estimated that the cost of the bascule bridge, including approaches, machinery, maintenance, etc., would not exceed 750,000*l.*, which is about one-half the sum that would be necessary for the construction of a high level bridge allowing of equal facilities for the river traffic.—*The Architect.*

Importance of Roads.

We are not aware that any estimate has ever been made of the actual cost of the public roads of the United States, or that the expense of providing them has ever been attempted by any bureau of statistics, but we make the rough estimate that they have cost at least seven hundred million dollars—probably much more—while unknown millions are annually expended in attempting to keep them in repair. If the money were only well applied, it would be an expenditure of great profit and economy, as everything which the farmer does off his own land is greatly affected by their condition. All his many loads of surplus farm products are drawn over them, and it makes some difference to him and to his horses whether those loads are conveyed easily over hard, smooth surfaces, or dragged through mud and against stones with severe labor to the team, fatigue to the driver, and wear and breakage to the wagon. Every week he and his family, more or less, go to the village for numberless errands, or to church on the Sabbath, and the good or bad condition of the roads seems to affect every fiber, pleasantly or unpleasantly, of their feeling or nervous sensations. On an average, there is at least twenty miles of traveling each week for the members of a single family. It would make a difference of five dollars a week, everything counted, whether this teaming and traveling is done over a nice, comfortable road, or through mud holes, sloughs, ruts, and unbridged streams, or against stones. Five dollars a week amounts to $250 a year, a snug little sum to tax the farmer with; and when this sum is multiplied by at least five million owners or drivers of horses, carriages, wagons, heavy teams, etc., the aggregate cost would be something over a billion dollars! Does any one say this is too large an estimate? Then proceed in detail and show in what particulars; but do not blindly and ignorantly say it is wrong without careful examination. Suppose, however, we admit that it is double the reality, is not the six hundred millions every year, expended directly or indirectly by our people, worthy of more attention on the part of patriots, statesmen, politicians, office seekers, public spirited men, writers for newspapers, agricultural journalists, and in fact of every one who passes over a road?

So long as our public highways in most parts of the country are made and repaired with so little interest and so little thought, we must suffer an enormous loss. We would like to ask how many of our readers, who drive or ride over the common roads, never see a loose stone, or a fixed stone, to strike, jolt and batter every passing wheel, or who do not see hundreds of them which might be removed with the expenditure of a small portion of the road tax? How many never saw sods and muck scraped into the road bed, to form a highway or "turnpike," which would be excellent for corn and potatoes, but which when worked into a mass of mud, or cut into ruts a foot deep, constitute a strange object to be called a "road?" How many never saw along the roadsides, thrifty patches of thistles, burdocks, mulleins, John's wort, nettles, etc., etc., ready to seed all the neighbors' fields? Until we can find such happy persons in the majority, we hope more attention may be given to correcting these evils, although we would not lessen the praiseworthy attention which is now freely accorded to enterprises and interests of almost infinitely less importance, but good in their small way.—*Country Gentleman.*

A Polish for Fine Carved Work.

Half-pint linseed oil, half-pint of old ale, the white of an egg, 1 oz. spirits of wine, 1 oz. spirits of salts; well shake before using. A little to be applied to the face of a soft linen pad, and lightly rubbed for a minute or two over the article to be restored, which must afterward be polished off with an old silk handkerchief. This will keep any length of time if well corked. This polish is useful for delicate cabinet work; it is also recommended for papier mache work.

Straightening Gun Barrels.

The *Forest, Forge, and Farm* tells how the gun maker utilizes shadows in his business as follows:

The straightening of a gun barrel is a very delicate and difficult mechanical operation, in which no machinery has as yet successfully competed with the human hand and eye. In addition to long experience, a natural adaptation to the work is necessary in order to attain any considerable degree of proficiency. The business is understood by comparatively few; indeed, many who attempt to learn it can make no progress whatever.

A plate of ground glass, size about 12x15 inches, and set in a dark frame, hangs against a window, some twenty feet from the workman. Horizontally across this glass is a bar of dark colored wood, three-eighths of an inch in width. Upon a convenient rest the operator lays a gun barrel, looking through it at the bar, which casts two fine lines or "shades" in the barrel. These join at the farther end, and gradually diverge, a break occurring in them wherever there is a "crook" in the barrel; the workman thus being enabled to detect the slightest deviation. In order to straighten the barrel it is put on a straightening block and the mechanic strikes it a blow with a steel hammer (these hammers vary in weight from three and a half to four pounds), the force of which is graduated according to kind of crook, size of barrel, and quality of steel. This alternate sighting and hammering is many times repeated, the barrel being turned slowly around while sighting, in order to locate any inequality which may exist at any point.

An inexperienced man may soon learn to tell if the barrel is straight, but it requires much practice to strike in exactly the right spot and with the proper force. The blow must be made in the exact place where the crook occurs, and if too hard, is worse than no blow at all. The barrel is thus treated six or seven times, and is rebored after each successive straightening.

Toward the last, finer crooks, known as "kinks," appear. These are shown by waves, instead of breaks, in the lines, and require light taps rather than blows. The nearer the barrel approaches perfection, the more skill is required to manipulate these kinks into unbroken lines. This is but one of many interesting operations through which a gun passes during the process of manufacture, in any of which its shooting qualities may be seriously impaired. A blow too light, or too heavy, too many, or too few; a discrepancy of one thousandth of an inch in the boring or rifling may transpose into a very poor gun one that would otherwise have been beyond criticism.

Formerly the process of straightening was effected in an entirely different manner, which, compared with the present mode, is both crude and unsatisfactory. One end of a silk or seaweed thread was attached to a bow a few inches longer than the barrel to be operated upon, the other end to a small lead weight known as a "sinker." This being dropped through the barrel, the bow was sprung, the thread drawn taut, and fastened thereon. The workman then looked through the barrel, observing where the light shone under the thread, thus detecting any imperfections. A barrel straightened in this manner, however, shows numerous defects when subjected to the modern method. In the old way the workman, standing near a window, examines and straightens the half nearest him; in the new he is away from the light and operates upon the other half, looking through either end as occasion requires.

The process described never fails to attract the attention of visitors at an armory, and is always looked upon as an interesting novelty. In view of the fact that the accuracy of a bullet's flight is dependent upon the perfection of less than one yard of barrel, it is wonderful that such good shooting can be done at more than one thousand times that distance.

A New Mechanical Constant.

At a recent meeting of the Physical Society, Prof. Perry pointed out the inconvenience of the ordinary constant, the "moment of inertia," employed in calculating the kinetic energy of rotating bodies. According to Rankine and others, the energy stored up in a rotating body, say a flywheel, is = $\frac{1}{2} I \omega^2$, where I is the moment of inertia and ω is the angular velocity. But in general machine practice the number of revolutions per minute is what is known, and ω has to be found from it by calculation.

Prof. Perry therefore proposes to introduce a more convenient constant known as the "M" at present for want of a better name. The M of a flywheel or other rotating body is the amount of kinetic energy possessed by the wheel when making one revolution per minute. Therefore to find the kinetic energy of the wheel at any other speed, say N revolutions per minute, multiply the M by the square of the number of revolutions per minute, N^2. Similarly, to find M from the number of foot pounds of energy in the wheel divide the latter quantity by N^2.

The French Observations of the Solar Eclipse.

A telegram from San Francisco says that the French astronomers who were sent to the Caroline Islands to observe the solar eclipse of May 6 have arrived at that place, and report finding a red star, which, it is believed, will prove a new discovery. The eclipse lasted five minutes and twenty-three seconds. They noticed several new features in the corona, chiefly white prominences, supposed to be vapor or white clouds.

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Correspondence.

Discoloration of Brick Walls.

To the Editor of the Scientific American:

In your issue of the 7th inst. there is an article entitled "Discoloration of Brick Walls," stating that the substance is magnesic sulphate. Previous to this I had seen similar statements in the *Popular Science Monthly.*

Having an opportunity to examine a building exceedingly disfigured, I have arrived at a different conclusion.

The Memorial Church in this place, erected by George Peabody in memory of his mother, is a massive brick structure built of solid walls, *i. e.*, without air space. After standing a few years, the structure became quite unsightly because of a white deposit covering almost its entire surface. Various were the conjectures as to the nature of this powder; the various "sidewalk committees" voting "nem. con." to be saltpeter from the clay; but alas! they were not able to explain how the same could withstand the fiery furnace of the kiln, like the Bible heroes.

A man skilled in cleaning buildings was therefore summoned from Boston, and at the expense of many hundreds of dollars he dressed the entire surface with dilute acid hydrochloric, with lasting results.

As there was a great amount of the substance in all the recesses of the brick work and on the scaffolds of the tower, I attempted a solution of the mystery, with the following results:

The salt dissolved readily in distilled water, making a nearly clear solution, with a slight sediment of carbonate of lime. The solution gave a mixed color to the flame of a lamp. I decided it to be both potassa and soda. Placed on a sheet of mica and exposed to the blow pipe flame it merely gave out its water of crystallization; as steam there was no characteristic odor, as of arsenic.

A weak solution of tartaric acid gave an effervescent reaction, and pure tartaric acid caused the evolution of a large amount of CO_2, as proved by conducting it into lime water.

There was no precipitate in tube after this.

From these rude experiments, conducted by a country doctor with apparatus necessarily limited to the requirements of urinary analysis, I came to the conclusion that in this case the powder is an impure carbonate of potash and soda. I forward you some by mail, and if you deem it of any importance I should like your opinion in some future number of your issue, which always is a welcome visitor to my house.

RALPH C. HUSE, M.D.

Georgetown, Mass., July 6, 1883.

DECISIONS RELATING TO PATENTS.

SUPREME COURT OF THE UNITED STATES.

MANNING *et al.*, APPELLANT, *v.* THE CAPE ANN ISINGLASS AND GLUE COMPANY *et al.*

Appeal from the Circuit Court of the United States for the District of Massachusetts.

Letters patent No. 134,690, for an improvement in the manufacture of isinglass from fish sounds, issued to the assignees, of the inventor, James Manning, January 7, 1873, declared invalid by reason of a public use of the invention for more than two years before the patent was applied for.

Where an inventor allowed to two persons the unrestricted use of his invention without injunction of secrecy or other condition, such use *Held* to constitute a public use.

Where through a series of years a machine and process were used without material change in either, such use *Held* not to have been experimental.

It is the policy of the patent laws to forbid the issue of a patent for an invention which has been in public use before the application therefor. The statute of 1836 (5 Stats. 117, sec. 6) did not allow the issue of a patent when the invention had been in public use or on sale for any period, however short, with the consent or allowance of the inventor; and the statute of 1870 (Rev. Stats. sec. 4,886) does not allow the issue when the invention had been in public use for more than two years prior to the application, either with or without the consent or allowance of the inventor.

U. S. CIRCUIT COURT.—SOUTHERN DISTRICT OF NEW YORK.

ZEUN *et al. v.* KALDENBERG.

A patent for a hand mirror in which an elastic cushion or packing is interposed between the glass and the back of the frame to press the glass against the beveled rim of the frame, infringed by one in which the packing, although it performs an additional office by being located outside the periphery, extends beneath the edge of the glass sufficiently to press the glass against the upper rim.

BY THE COMMISSIONER OF PATENTS.

HALL *v.* JOHNSON.—IMPROVEMENT IN NIPPERS.

Where two persons independently make the same invention, the inquiry in an interference proceeding is who made the invention first; but where two persons claim to have first originated the ideas embodied in a particular machine, the question is which of said persons shall be considered entitled to the invention.

He who first produces a device is entitled to be considered the inventor thereof, unless it be shown that another person was first to conceive of the invention and was using due diligence in completing it, or was the first to suggest to the one who first produced the device all of its parts, so that in producing it he was simply carrying out the suggestions of another.

Mere suggestions, even if they point toward a result, are not sufficient to entitle one making them to be considered the inventor. In order that he may claim the benefit of what another does, the suggestion must leave nothing for the mechanic to do but to work out what has been suggested.

Combinations may be made up of parts entirely new or entirely old, or part new and part old; but if the parts when brought together so coact as to produce a new and beneficial result, the party so bringing them together has made an invention, and is entitled, if he makes claim thereto, to a patent therefor. If new elements are added to an imperfect combination, and if by the addition of such new elements the combination is made perfect and operative, the person who adds such elements is entitled to claim the new combination.

The addition to an old form of nippers of a prong and notch connection between the hand levers and a projection or lip over the spring is a patentable improvement, and in an interference between two parties claiming to have suggested this improvement the question is which of the parties added to the old instrument these devices, which rendered it complete and operative.

The officer of a company in whose works a certain improvement was originated and perfected cannot be considered the originator or inventor of the same. In order that an employer may claim the benefit of improvements made by an employe, the employe must be specially employed to assist in carrying out an invention conceived by the employer.

Whether such company has not an implied license from the inventor to use the invention, from the fact that such inventor did not assert his right thereto while in its employ, is a question for the courts and not for the commissioner.

BY THE COMMISSIONER OF PATENTS.

GILL *v.* SCOTT.—PRINTING PRESS.

He who uses reasonable diligence and first reduces an invention to practice, embodying it in practical form, must be regarded as the first inventor, and entitled to a patent as against one who, although prior in time in making it, by negligence allows it to remain unknown.

Where inventors withhold their inventions and confer no benefits upon the public there is no reason why protection should be afforded them if other and more diligent inventors produce the same thing and do confer such benefits.

The rule is well established that an applicant cannot have a patent for that which has been patented to another unless he shall make out such a case as would defeat that patent.

London's New Gas Main.

While the citizens of New York have during the past two years been subjected to the greatest inconvenience and discomfort, both summer and winter, by the laying of steam and other pipes through their streets, and the most hearty grumbling has been indulged in, and the most opprobrious epithets have been bestowed, not only upon the corporations which have been the efficient cause of all the trouble, but upon the city government for permitting such atrocious liberties to be taken with their streets, it is a matter of some consolation to be reminded that London has for the past few months been subjected to similar annoyance.

The largest gas main in the world is now being laid through the very heart of that city. The diameter of the main is 6 feet, and the entire length of the main with its branches is already 23 miles. Each section of pipe is 12 feet long. The pipe is laid at a depth of from ten to fifteen feet below the surface of the ground. The analogy, however, between the work done in the two cities ceases with the discomfort caused to the citizens of each, for in London, in spite of the depth at which the main must be laid, and the immense size of the pipe, from 12 to 120 yards of main is laid per day, and three squads of 100 men each are employed in the work. When the work reached Trafalgar Square, in order that traffic at that important point might not be impeded a tunnel 40 feet long was driven under the square and the main was laid at a depth of 25 feet. The necessity of laying the main at such a depth at this point was due to the fact that a large number of sewers, mains, and telegraph and electric pipes were met with, and this proved to be the only effective and satisfactory method of avoiding them.

Starch from Sugar.

Every one knows nowadays that we can make sugar (one kind at least) out of starch, but as yet we are no more able to reverse the operation than we are to combine carbonic acid with water or alcohol to make sugar.

Bohm's experiments go to show that in the plant both operations take place, viz., making sugar from carbonic acid and the conversion of this sugar into starch, the chlorophyl granules being the agent that aids in this change under sunlight.

Sea Weeds and Land Weeds.

London papers say that "the secretary to the Royal Botanic Society recently tried the novel experiment of planting sea weeds in ordinary earth. It would naturally be supposed that these 'flowers of the ocean' would not flourish away from their native element; but this is not the case, most of the specimens planted having grown admirably in soil which is constantly kept in a moist condition." The result is both curious and suggestive, and worthy of trial this side of the ocean.

How to Protect Fruit from Insects.

Fruit and forest trees, shrubbery, vines, and flowers have been more infested with bugs and worms this year in this part of the country than for a long time, and gardeners are put to their wits' end to know how to get rid of their enemy.

The advice given below is selected from the writings of experienced horticulturists, and *Forest, Forge, and Farm* recommends the trial of some of the remedies.

"Oils of all kinds are deadly to most insects. Kerosene can only be used by diluting with water. To mix oils with water, first combine them with milk, then dilute, as desired, with water. Sour beer and molasses attract moths, spread on boards placed in the orchards or on trunks of trees. Paris green is very effectual when it can be well applied; one pound mixed with twenty-five pounds of flour or plaster is sufficiently strong. Of London purple use only one part by weight to fifty parts of flour or plaster. The common ground beetles, the lace winged flies, and the well known 'lady bugs,' are old friends of the horticulturist, and should be protected. As regards the noxious insects, the coddling moth ranks, for destructiveness, nearly at the top of the list. Paper or cloth bands are used, applied every ten days through spring and early summer, and in connection with the use of a proper wash. The apple tree borers, of which there are several kinds, are enemies of the apple, the quince, and some other trees. When observed, cut the larvæ out with a knife and place a sheet of tarred roofing felt about the collar of the trees to prevent further ravages. Dustings of lime are effectual with the cherry and pear slugs, abundant in moist regions, such as about Puget Sound. The plum curculio, which is not here yet, but is perhaps on the way, is an enemy that at present cannot be conquered. There is no remedy known except the jarring process, to commence as soon as the fruit sets, and jar the tree three times a week for a month. This shakes off the curculio bitten fruit, and it should be gathered up and destroyed. The steel blue beetle known as the grape flea beetle nips the vine in the bud; the larvæ feed on the leaves in the summer. The beetles are jarred off the vines in the early morning, over an inverted umbrella. or lime is used; for the larvæ, alum water. One ounce of alum to a gallon of warm water destroys the strawberry worm; so does white hellebore. Hand picking is about the only remedy for the gooseberry fruit worm. The currant borer is troublesome. Cut out and burn all infected branches. Do the same with the raspberry twig girdler."

The Stars as Seen in Egypt.

At a recent meeting of the Royal Astronomical Society, Professor C. Pritchard gave an account of his recent expedition to Cairo, and of the work on which he has for the last two years been engaged, viz., the measurement of the magnitude of the stars visible to the naked eye from the pole to the equator, including at present all those brighter than the fifth magnitude. This work is now complete. He found that, at Oxford, Laplace's law of alteration of a star's light as measured in magnitude—according to the secant of the star's zenith distance—did not hold good for zenith distances exceeding 65°, and that for stars at lower altitudes the alterations in apparent magnitude were conflicting and not satisfactory. For the purpose of accurately investigating the effect of atmospheric extinction of light under better circumstances, he chose the climate of Upper Egypt, where the atmosphere is uniform and stable, as the proper locality for repeating the Oxford observations, and rendering the research complete. A duplicate set of instruments was at Oxford in charge of the senior assistant, who observed the same stars with Professor Pritchard at Cairo. The results of both sets of observations are embodied in the formulæ:

Atmospheric absorption

At Cairo = 0·187 × Sec. Z.D. in magnitude.

At Oxford = 0·253 × Sec. Z.D. in magnitude.

Thus the whole effect of the atmosphere at Cairo is to diminish the brightness of stars seen in the zenith by about two-tenths of a magnitude, and at Oxford by about one-fouth of a magnitude. At an altitude of about 30°, the stars at Cairo will be brighter than in England by about one-fifth of a magnitude, and consequently many more faint stars are just visible at Cairo than can be seen at Oxford.

American Association for Advancement of Science.

The thirty-second meeting of the American Association for the Advancement of Science will be held at Minneapolis, Minn., beginning August 15th, and closing Aug. 21 next. Professor C. A. Young, of Princeton, will preside. Information regarding transportation may be obtained by addressing Thomas Lowry, Esq., Minneapolis, Minn. All matters relating to membership, the presentation of papers, and business to come before the meeting will be attended to by F. W. Putnam, permanent secretary, who may be addressed at Salem, Mass., up to August 8, and afterward, up to the close of the meeting, August 21, at the Nicollet House, Minneapolis, Minn.

THE Florida Ship Canal Company has, it is stated, been organized at Washington, with £5,200,000 subscribed capital, to construct a canal across Florida, deep enough for the largest ships, between the St. John's and Suwanee rivers. Work is to be commenced in September next.

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IMPROVEMENT IN POCKET KNIVES.

The greatest defect of the ordinary pocket knife lies in the means provided for opening the blades. This is particularly noticeable in knives with strong back springs. Broken finger nails and sore fingers, with an occasional cut, bear witness to the desirability of an easier way of opening the blades. Our engraving shows an improvement designed to obviate this difficulty, and to facilitate opening the blade by substituting the pressure of the ball of the thumb for that

DU BOIS'S IMPROVED POCKET KNIFE.

of the thumb nail, while permitting of the same natural and intuitive motion to which knife users are accustomed.

The invention consists of a pivoted blade lifter arranged to shut within the handle, and provided on the inner side with a stud or spur capable of engaging the notch in the blade, and on the outer side with a knob or thumb piece to receive the pressure of the thumb. These lifters may be applied in two ways, as shown in the engraving, one being short, and having its pivot at one side of the blade pivot; the other being longer and placed on the same pivot with the blade and swinging on the same center. Either of these lifters may be made to serve the purpose of a button hook for glove or shoe, or as a nail cleaner, or they may be fitted for any other useful purpose in addition to that of opening the blade.

This blade lifter or opener applied to a knife, as described, will be found exceedingly useful where the blade is a stiff one, especially by ladies, many of whom are unable to lift the blades of a good knife with their thumb or finger nails. The motion of operating this lifter is such a natural and easy one that the lifter may be used in the dark as well as in the light.

The lifter may be provided with a back spring or not, as may be deemed advisable. It may be applied to knives at a trifling expense, and will prove a great convenience to knife users.

This useful invention has been patented by Mr. George W. Du Bois, of Wilmington, Del.

A Superior Whitewash.

For a useful lime wash for wood and stone *The Journal of the Society of Chemical Industry* gives the following method of preparation: Twenty liters quicklime are slaked in a suitable vessel with as much hot water as will stand at a level of 15 cms. above the lime. The milk of lime is diluted, and first 1 gramme of sulphate of zinc and then 0·5 gramme of common salt are added. The latter causes the lime wash to harden without cracking. A beautiful cream color can be imparted to the mass by putting into it 0·5 gramme of yellow ocher, or a pearly tint by the addition of some lamp black. A fawn color is produced by two grammes of umber and 0·5 gramme of lamp black A stone color can be obtained, from 2 grammes of umber and 1 gramme of lamp black. The color is applied, as usual, with a brush.

Hourly Tides in a River.

According to the *Lockport (N. Y.) Journal*, the water in the Niagara River at that place presented the phenomenon, on the afternoon of July 2, of hourly tides, the water rising and falling several feet once an hour. The cause does not appear to have been discovered.

Profit of Mushroom Culture.

The *Dublin Gardener* quotes a letter from a Mr. Barter, giving his results of mushroom culture, which shows that less than an acre of ground planted to mushrooms in the vicinity of London, supported four families—that of the lessee of the ground and those of three workmen receiving £4 each per week. Mr. Barter says that he is a carpenter by trade, and hired little more than an acre of land for £12 per year, and is gradually putting the entire area to mushrooms, expecting at least five tons weight of the esculent, at a wholesale price of one shilling a pound. He plants the spawn in beds two and a half feet wide, one of which, twenty yards long, yielded 160 lb. at one gathering, and another, 25 yards long, gave at the first gathering 76 lb., the second 200 lb., and the third 84 lb., or 360 lb. in three weeks.

AN AERIAL TURBINE WHEEL.

The form of the wings of this mill, says the *Revue Industrielle*, from which we translate, has been studied with a view of satisfying all the required conditions, which are comprised in the following rules: Conforming to the Smeaton rule of exposing seven-eighths of the geometrical surface of the sail; presenting as large a surface as possible at the extremity of the arms; curving the wings or sails so as to present the minimum of resistance to movement in light winds; and presenting at the rear a large surface as resistance to the air accumulated and compressed by rapid movement in high winds.

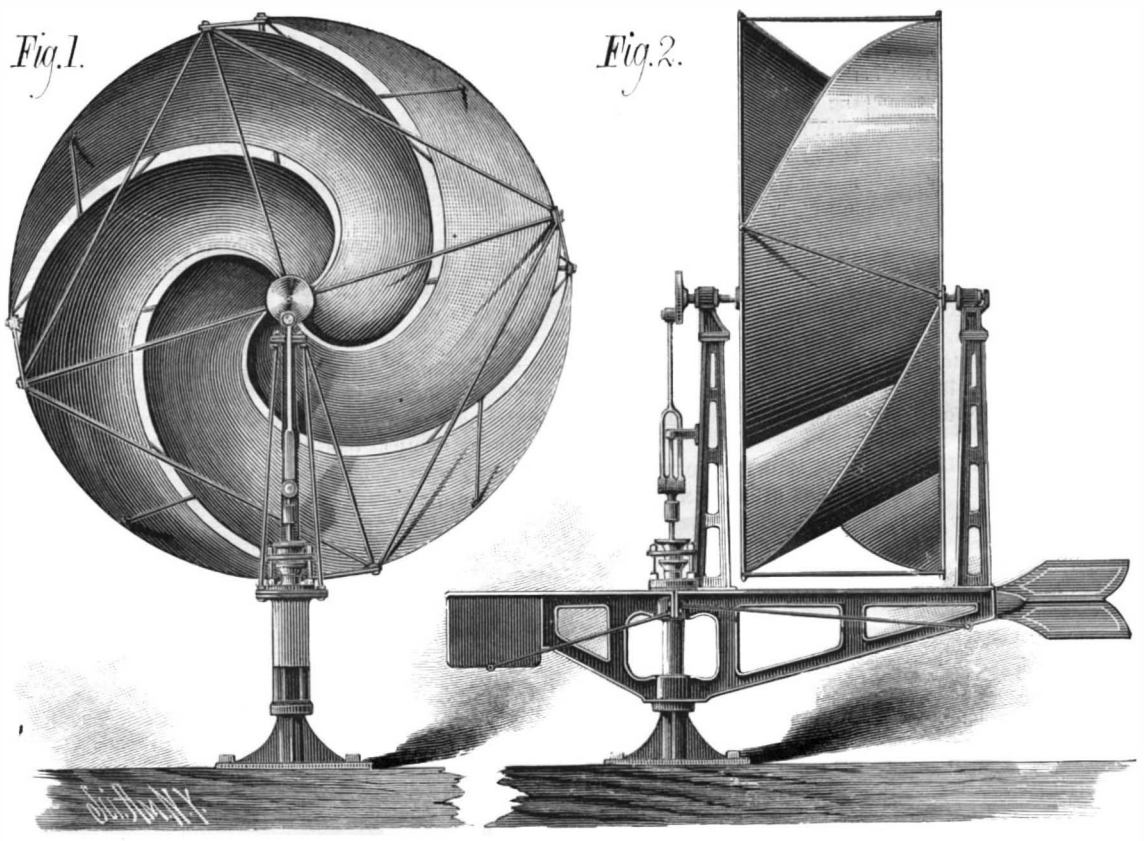
The results obtained by these rules are forms of wings which preserve an equilibrium between the force of the wind tending to overturn the structure and the cumulative resistance of the air tending to sustain it in the opposite direction. Mr. A. Dumont, the inventor of the turbine herewith illustrated, constructed a wheel having a diameter of 2 meters, and presenting a surface to the wind of 3·14 meters, and he made his observations with a wind of 8, 9, and 10 meters a second.

Under these conditions it raised a weight of 8 to 12 kilogrammes for every meter of surface, and when in full motion the wheel could easily be made to turn in a direction contrary to that of the wind. If a gust of wind struck the wheel the pressure was at once felt, and the rate of speed immediately increased and the equilibrium was re-established.

In order to observe the action of the wind as it passed through the chutes of the wheel of his aerial motor, Mr. Dumont tried the following experiment: One of his machines being actuated by a very violent wind, he placed at different heights in front of the wheel pieces of black and white paper finely torn, and he observed that the wind as it passed through the wings of the wheel did not undergo any deflection, and that the layers of different colors were found at the same height and in the same relation at a distance of 1·50 meters behind the wind wheel. The inventor has formulated this result as follows:

Two molecules of air meeting the wing, each at a different point, cross it and lose thereby a certain amount of their velocity, which nevertheless is always the same for the two molecules. After having given up in part their impulsive force, they leave the wheel at the rear without being sensibly changed in their direction.

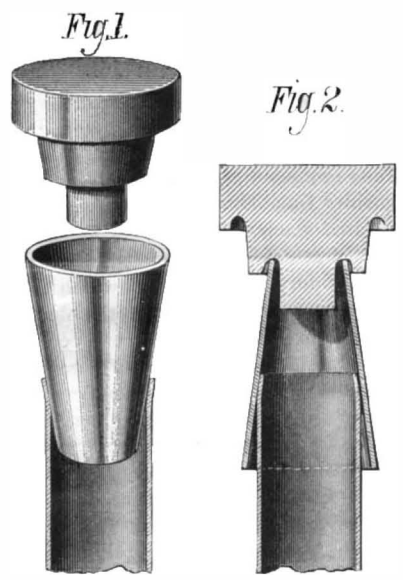
Further experiment proved, says our contemporary, that the apparatus with 2 meters of diameter, operating in a wind of 7 meters, and actuating a lift pump, develops a power of 10 kilogrammes. The results of other experiments have been tabulated and appear in the *Revue Industrielle*, but lack of space does not admit of our producing them.



AN AERIAL TURBINE WHEEL.

DEVICE FOR FITTING STOVE PIPES.

The annexed engraving shows a simple and effective device for contracting or expanding the ends of stove pipe to make the ends of the adjoining lengths fit into each other. The tool consists of a hollow cone of cast iron, which is inserted into or placed upon the end of the stove pipe length, and crowded downward to expand or contract the end of the pipe, as the case may require.



DEVICE FOR FITTING STOVE PIPES.

This tool is made large enough at one end and small enough at the other end to adapt it to the usual range of sizes. A wooden plug is provided which may be inserted in either end of the cone whenever it is necessary to drive the cone into or upon the end of the pipe. This will be necessary only in case of very heavy pipe, as the mere crowding down of the cone by the hands alone serves to expand or contract the ends of pipe of ordinary thickness.

The inner and outer surfaces of the cone being parallel, the edges will be flared and contracted at a corresponding angle, so that the end of the one pipe may be inserted into the other without the trouble usually attending the fitting of stove pipes. Fig. 1 shows the hollow cone employed in expanding the end of the pipe; Fig. 2 shows the manner in which the pipe is contracted. The wooden plug which is inserted whenever it is necessary to drive the cone is shown in both figures.

Further information in regard to this invention may be obtained by addressing N. C. Pettit, Waldo, Fla.

Cooking by Gas.

Let me put on record the result of some experiments made with gas ovens, which will be of interest to all. It is generally acknowledged, without question, that an oven lined with slag-wool is the best, because it is supposed "to save 40 per cent of gas," and do other wonders. Now, the average cost of gas for oven work in a private house will not exceed, at the most, about 15 or 20 cubic feet per day. A saving of 40 per cent on this, even if it existed in practice, would not be particularly important to any one except the very poorest. I took a common cast-iron oven, 16 inches square and 20 inches deep, weighing 1 cwt. 2 qrs. 15 lb., and inserted an ordinary Bunsen ring of good construction in the bottom. With free ventilation and a gas consumption at the rate of 14 cubic feet per hour, I obtained the following temperatures in the center of the oven:

In 3 minutes.....	250°	Fahr.
" 5 " ...	300°	"
" 8 "	360°	"
" 12 "	400°	"

With a consumption of less than 2 cubic feet of gas, I got up a common heavy cast-iron oven—freely open to the air, and not jacketed in any way—to a first rate heat for pastry, and in perfect working condition. It is evident that such an oven, of good capacity, can be heated to a good temperature for roasting meat, every day for a week, for a cost of one halfpenny or less per week. These experiments were made with an oven in practical working condition, with three strong shelves, one being between the burner and the thermometer. The result can, I think, easily be accounted for by the fact that iron does not take up heat at all readily or quickly, and makes a good retainer of heat. The outside of the oven is a long time before it becomes even warm to the hand.

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The Effect of Tobacco on Children.

Dr. G. Decaisne has submitted to the Society of Public Medicine the results of some interesting observations concerning the effects due to the use of tobacco among boys. Thirty-eight youths were placed in his charge, whose ages varied from nine to fifteen, and who were in the habit of smoking, though the abuse of tobacco varied in each case. The effects of course also varied, but were very emphatic with twenty-seven out of the thirty-seven boys. With twenty-two patients, there was a distinct disturbance of the circulation, bruit at the carotids, palpitation of the heart, deficiencies of digestion, sluggishness of the intellect, and a craving, more or less pronounced, for alcoholic stimulants. In thirteen instances there was an intermittent pulse. Analysis of the blood showed in eight cases a notable falling off in the normal number of red corpuscles. Twelve boys suffered frequently from bleeding of the nose. Ten complained of agitated sleep and constant nightmare. Four boys had ulcerated mouths, and one of the children became the victim of pulmonary phthisis, a fact which Dr. Decaisne attributed to the great deterioration of the blood produced by prolonged and excessive use of tobacco. As these children were all more or less lymphatic, it was not possible to establish a comparison according to temperament; but of course the younger the child the more marked were the symptoms, and the better-fed children were those that suffered least. Eight of the children in question were aged from nine to twelve years. Eleven had smoked for six months, eight for one year, and sixteen for more than two years. Out of eleven boys who were induced to cease smoking, six were completely restored to normal health after six months, while the others continued to suffer slightly for a year. Treatment with iron and quinine gave no satisfactory result, and it seems tolerably evident that the most effective, if not the only cure, is to at once forswear the habit, which to children in any case is undoubtedly pernicious.—*Lancet.*

Centrifugal Force.

Professors Ayrton and Perry exhibited at a recent meeting of the Physical Society an ingenious lecture apparatus for demonstrating the laws of centifrugal force. As was properly pointed out by Professor Ayrton, the ordinary lecture apparatus of this kind do not really demonstrate the laws of the subject, but simply show the effect; and a new and more scientific class of apparatus is demanded by the extension of scientific teaching. Professor Perry and he had been engaged in designing new apparatus to meet the wants of their City Guilds students, and the apparatus shown was one of the instruments in question. It consists of a rotating vertical axis carrying an aneroid chamber filled with mercury, which also rises in a graduated capillary tube projecting from its middle. A metal arm projects at right angles from the aneroid or diaphragm side of this chamber, and carries a sliding weight which can be shifted to different distances on the graduated arm. On rotating the axis the centrifugal force of the projecting arm pulls on the elastic diaphragm of the mercury chamber, and the mercury within it having more room sinks in the capillary tube by a corresponding number of degrees. The apparatus is capable of demonstrating the law of centrifugal force with accuracy, according to experiments which have been made; and, as Professor Guthrie remarked, it could be used for indicating the speed of wheels and shafts. We may add that there is already a mercury counter in existence, in which a closed mercury chamber is rotated, and the parabolic concavity given to the mercury by the centrifugal force is employed to measure the speed.

Proposed $50,000 Prize for a Gas Engine.

At the recent meeting of the Gas Institute, Sheffield, Eng., Mr. Thomas Warrington read a paper relating to suggestions for increasing the consumption of gas, in which he said:

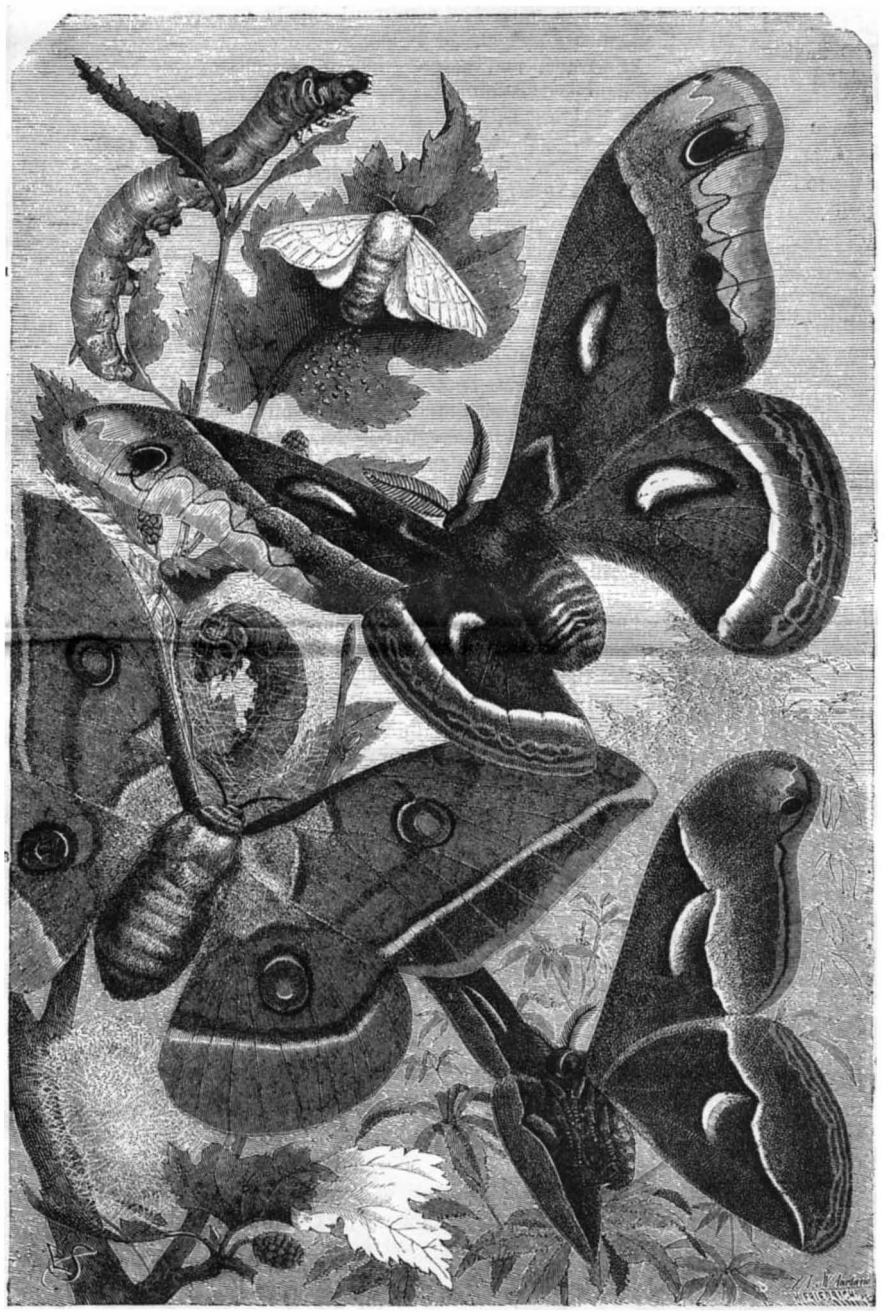
"A good source of profit is the consumption for gas engines; but the use of these is at present limited by their excessive first cost. So long as a steam engine can be fixed for half, or less than a half, the first cost of a gas engine, the latter is too heavily handicapped; and I offer it as a crude suggestion, that the gas companies should jointly copy the system of the Society of Arts, and offer a prize well worth having for a gas engine, satisfactory in all points, which should cost no more to fit up than a steam engine. A prize of £10,000 would be exceedingly well expended on this, and would be a trifle to each subscriber to the fund. It would certainly make a move in gas engines, and stir up the makers in an astonishing way; and a subscription of about £7 from each gas works would cover the total cost.

SILKWORMS AND MOTHS.

The various silk producing moths belong to the family Bombycidæ; upward of forty varieties of these moths may be found in various parts of the world.

"These insects secrete the silk in two large intestine-like vessels in the interior, which contain a gelatinous like substance and become very large before the caterpillar changes into a pupa. Both the silk organs unite in a common tube at the mouth called the spinneret, and through this tube the semi-liquid is ejected. When it comes in contact with the air, it hardens. The caterpillar employs the silk for a cocoon which it gradually forms into an oval shape. The outermost layers are rough and are stripped off before the thread is spun into a bank."

As the most beautiful singers among the birds are clothed in the plainest dress, so with the most useful of all the butterflies, the "mulberry silk spinner." The breadth of the wings is from forty to forty-five millimeters. It is a mealy white color, and the double row of serrations on the antennæ are black. The anterior wings have a crescent shaped point in the deeply curved edges. A yellowish brown crossline is also visible. The caterpillar called the "silk worm" is the most perfect of all the spinners. It is grayish white and has brown and reddish yellow spots on the back. Its only nourishment is the leaves of the mulberry tree. The cocoon is egg shaped, and the loose silken threads surrounding it are either white or yellow.



1.—MULBERRY SILK WORM AND MOTH. 2.—SOUTH AMERICAN SILK SPINNER. 3.—CHINESE SILK SPINNER. 4.—AILANTUS SILK SPINNER.

In all probability the silk worm came originally from China, the native country of the mulberry tree. In the reign of the emperor Justinian two Persian monks smuggled into Constantinople some mulberry plants and eggs of the silk worm, which they had stolen and concealed in their hollow walking sticks. The culture of silk worms has been carried on in Europe since 520 A.D. It was introduced into Greece in the twelfth century, and from Greece was carried through Arabia and into Spain.

In the middle of the twelfth century, through the war which Roger II. carried on with the Byzantine Emmanuel, silk culture was introduced into Sicily and extended to Florence, Milan, and the rest of Italy. In the reign of Henry IV., it was introduced in France, and from there extended farther north. In 1670 the first company for the culture of the silk worm was formed in Germany. Frederick the Great himself introduced this branch of industry in his kingdom, and in the second half of the sixteenth century silk culture had found an entrance everywhere in Germany. The war for freedom gave a blow to this new industry, for the times were not suited to the culture of the worms or the plucking of mulberry leaves. The trees became old, did not increase, and were scarcely valued except by the village youths who ate the sweet fruit. In later times the subject was again agitated, and in Prussia was regarded very favorably. Mulberry hedges were planted, as they furnished the leaves more speedily and conveniently than the trees. Then came the news from the silk producing countries of southern Europe of the appearance of disease among the silk worms, and at the present day, in proportion to the demand for silk, there is comparatively no silk produced.

The Chinese oak silk producing moth has yellowish brown wings, with a fine white line passing through them, bordered on the inside by a slender brown line, with crosslines of brown. On each wing there is a round dark spot broken by a white marking. Three days after pairing, the females lay their large brown eggs in heaps upon the sides of their dwelling place. Eight or ten days later the black caterpillars emerge from the eggs. After the second changing of the skin the worm becomes a yellowish green. In about fifty-two days they begin to spin.

The growing caterpillar is distinguished from the very similar Japanese silk spinner by a brown, dark spotted head, which gives it the name of the "brown headed oak caterpillar." It eats night and day with only a short intermission. This butterfly has in its native country, as with us, two broods in a year. After a report made by Abbe Paul Perny of the province of Kuy Tscheu, to the Parisian Company, the second brood with the pupas were kept through the winter in rooms, and the temperature was carefully regulated day and night. The females were placed in willow baskets, where they laid their eggs. After the caterpillars came out of the eggs, oak branches were put in the baskets. As soon as they could crawl, they were transferred to an oak forest which consisted only of an undergrowth; the ground was kept clean, so that the down falling worms could be easily picked up. For this purpose, and in order to frighten away the birds, a watchman was provided for each colony.

In forty or forty-five days after the caterpillars emerge from the eggs the cocoon harvest commences. The best ones are sought out for further breeding. The rest are placed upon bamboo hurdles and a fire built beneath them, to put the pupa to death. They are then placed in a vessel of boiling water for from eight to ten minutes. Then two handfuls of buckwheat ashes are put in a bowl of water, and the mixture added to the boiling water in which the cocoons are placed.

The Chinese dry the stalks of the buckwheat in the sun, after the grain is harvested, and set fire to the heap. The ashes are supposed to have the same effect as potash. The cocoons are then moved around with a spatula until the threads are loosened and wound around the spatula. Then five or eight threads, according to the strength desired, are placed in the opening of a reeling machine, and the cocoon is wound off. The second brood is treated in the same way as the first. The Chinese reap a rich profit from these silk spinners. The silk is firmer and cheaper than that of the mulberry spinners.

The ailantus silk worm feeds upon the leaves of the ailantus tree. Rearing this moth is easy, as the caterpillars remain upon the tree and spin their cocoons in the branches. The color of the caterpillar is greenish yellow marked with black. The ground color of the moth is a velvety reddish brown, the bands white; the edge of the crescent-shaped spot is yellowish. The worm is hardy and not subject to many diseases to which the silk worm is liable, and seems to be free from the fungoid parasite which often destroys so many silk worms. The silk is strong, but does not have much gloss.—*From Brehm's Animal Life.*

Coal Gas and Water Gas.

In response to a resolution of inquiry from the Board of Aldermen of Brooklyn, N. Y., as to the relative qualities inimical to health of coal gas and water gas, a report has been made containing analyses and statements by Professor Ira Remsen, of the Johns Hopkins University, who says that coal gas contains 7·9 of carbonic oxide in 100, and water gas 28·25 parts to the 100. Carbonic oxide is a deathly gas, and either of these illuminating gases, if inhaled in sufficient quantities, would produce death, but long before enough of either to produce bad effects could accumulate in a room, it would necessarily be detected by its odor. In case the occupants of the room were asleep, it was possible a fatal effect might be reached a few minutes earlier in the case of water gas than in that of coal gas.

A SIX-POUND pickerel, caught near Shelby, Iowa, had attached to it a complete set of fishing tackle, except the pole.

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Chemical Appliances for Extinguishing Fires.

It hardly seems to be an open question concerning the value of apparatus intended to extinguish fire through water impregnated by gases antagonistic to combustion. In the earlier days of chemistry, it was discovered that carbonic acid would extinguish flame, and in one form or another the principle was applied in Europe.

When William A. Graham filed at Washington his caveat for a fire extinguisher, the patent officials were unable to determine whether this was a new invention, and a special act of Congress was passed authorizing the issue of the patent, dated July 9, 1878, entitling his administrator to manufacture, use, and sell apparatus for extinguishing fires by the use of carbonic acid gas. Under this patent seven licenses were granted, yet all but one of these licenses were allowed to lapse. This has occasioned a tedious lawsuit, which ended in a very positive decision, May 9, 1883, by Judge R. W. Hughes, presiding over the United States Circuit Court in the Western District of Virginia, sustaining in every point the claim of the patentee, and giving the sole right to Charles T. Holloway to manufacture or to sell apparatus for extinguishing fires by the use of carbonic acid gas.

This long legal fight and clear decision have brought chemical extinguishers into greater prominence, though they should be familiar objects to every observant man. It would seem as though Brooklyn, as a great oil refining center, would patronize largely the manufacturers of chemical apparatus, yet the *Spectator* Year Book reports it as having no extinguishers in its fire department. Brooklyn has nineteen steam fire engines, and last year $11,000 were raised by taxation to add new apparatus. Over five months ago the Fire Commissioner asked the Aldermen for authority to use a portion of the money already in the treasury to buy two chemical engines. The request was referred to the Sewerage and Drainage Committee! and has laid there five months. A testimony to the value of chemical apparatus was signed by officers of New York insurance companies representing assets to the amount of forty-five million dollars. Meantime the committee has not drained a dollar into their pockets, and the bill remains under duress. This condition of affairs seems remarkable, and at the present time not even a common extinguisher belongs to the fire department of Brooklyn.

Buffalo, with less than one-quarter of the population of Brooklyn, has five chemical engines; Albany reports twenty-five chemical extinguishers as belonging to the fire department, and Chicago possesses five chemical engines and eighteen chemical extinguishers, besides those carried by Ben Bullwinkle's fire patrol. Boston has seven chemical engines and thirty-eight chemical extinguishers, and the enterprising town of Weymouth, Mass., owns a chemical engine and seventy-five chemical extinguishers. Detroit has two chemical engines and six extinguishers in the department, while Cleveland only reports ten extinguishers. Philadelphia is not credited with any chemical appliances, but lately it has roused from slumber and sent a liberal order for these adjuncts to steam fire engines. New York city has nine chemical engines and 108 extinguishers in the department, and at every fire there is a race between the fire laddies and the patrol boys to see who shall be the first to get into a building with an extinguisher, which is frequently used with good effect. New Orleans has five chemical engines, and the Pennsylvania Railroad owns eleven chemical engines and numerous extinguishers. The Baltimore fire department used chemical extinguishers 684 times in 1881 and 813 times in 1882, putting out a large proportion of all fires without using water from the fire plugs or engines. Outside of that city, in the hazardous manufacturing district of "the Belt," one efficient department has been organized with chemical apparatus only, having nine engines and many portable extinguishers. Its efficiency was well tested at the explosion of two stills in a coal oil refinery, January 7, 1882, when two chemical engines checked the fire, to the surprise of all spectators. Water will not extinguish burning coal oil; besides, every gallon in a chemical tank is as effective in checking an ordinary fire as forty gallons of water.—*Insurance World.*

The Antiquity of Man.

An interesting discovery, of much importance for geological and archæological science, has recently been made in a coal mine at Bully-Grenay, in the French department of Pas de-Calais. A new gallery was being pierced, when a cavern was broken into, which discovered the fossil remains of five human beings in a fair state of preservation—a man, two women, and two children composed the group. The man measured about seven feet, the women six feet, and the children four feet and rather less than this. In addition, some fragments of arms and utensils of petrified wood and of stone, with numerous remains of mammals and fish, were brought to light. A second subterranean chamber inclosed the remains of eleven human bodies of large size, several animals, and a large number of various objects, with some precious stones. The walls of the cave exhibited drawings representing men fighting with gigantic animals. Owing to the presence of carbonic anhydride a third and larger chamber, which appeared to be empty, was not searched. Five of the petrified human remains will be exhibited at the mayoralty of Lens. The remainder of the bodies which have been brought to the surface are to be conveyed to Lille, there to await a thorough examination by the experts of the Faculte des Sciences. Information has been telegraphed to the representatives of the Academie des Sciences of Paris and to those of the British Museum. If the discovery be a real one, no doubt can be entertained of the value of the find, which would on the face of it seem to show that prehistoric man is anything but a myth.—*Lancet.*

The Geology of Philadelphia.

In a lecture before the Franklin Institute, Prof. H. Carvill Lewis gave the following:

Recapitulating the various surface formations here distinguished occurring at Philadelphia we have, beginning with the most recent:

Formation.	*Geological Age.*
Recent alluvium.	Modern.
Trenton gravel.	Post-glacial.
Philadelphia brick clay.	Glacial.
Red gravel.	Glacial.
Yellow gravel.	Pre-glacial.
Bryn Mawr gravel.	Tertiary.

In these six deposits is written the ancient history of the Delaware Valley. If we read the record aright, they tell us that, long ago, before man was created, when strange mammals roamed abroad, and when all southern New Jersey lay deep beneath the Atlantic, the waves of the ocean broke upon the hills of Bryn Mawr, Chestnut Hill, and Media. At the same time, an inlet from the sea extended over a great part of the Montgomery County limestone valley, depositing clays holding extensive beds of iron ore. This region, then 450 feet lower than now, was afterward slowly upheaved, and as the waters retreated, the yellow gravel was probably formed. Afterward, and perhaps in consequence of this rise, the climate grew colder, and glaciers crept down from Greenland and Labrador, forming a huge *mer-de-glace* thousands of feet in thickness, which advanced to within 60 miles of Philadelphia. Again the land descended 175 feet lower than it now is, and again the waters covered the city. This time it was fresh water of icy coldness, bearing great icebergs, which stranded on the shores formed by the hill at Wayne Junction, Belmont, George's Hill, Hestonville, Haddington, and Swarthmore. At this time the river Delaware was 10 miles or more in width, nearly 200 feet deep, and, as a roaring flood, deposited the red gravel and left in it the records of its waves. As the flood became more quiet, though still filled with mud derived from the base of the glacier, the brick clays were laid down, the floating ice floes meanwhile dropping their far-carried bowlders all over our city.

After many thousands of years, the "Great Ice Age" at length came to a close, the land rose to about its present level or somewhat higher, the waters retreated, and finally, as sudden elevations of temperatures thawed the glaciers still remaining in the head waters of the Delaware, there came those last great floods which deposited the "Trenton gravel." The Delaware, then so wide as to submerge most of Trenton, all of Bristol, and the river front of Philadelphia nearly up to the State house, was again filled with floating icebergs. The walrus played in its waters, while the reindeer and the mastodon roamed on its banks. Man also then first appeared. With habits most probably like those of the Esquimaux, living in most primitive ways, he hunted and fished on the banks of the swollen Delaware, and occasionally dropped into the water his rude stone implements, long afterward to be found to tell the story of their makers.

Finally, the land began the sinking which is now in progress, the climate grew warmer, the Red Indian was introduced, and the modern era began.

This, in brief, is the tale told by our clays and gravels. Surely the long despised cobble stones of our ill-paved streets become more worthy of our respect when we know their story. Still more interesting do they become when we learn that they can tell us of the early history of our own race.

The Metallization of Wood.

Les Mondes describes the following process invented by Mr. Rubennick for metallizing wood:

The wood is first immersed for three or four days, according to its permeability, in a caustic alkaline lye (calcareous soda) at a temperature of from 75° to 90°. From thence it passes immediately into a bath of hydrosulphite of calcium, to which is added after twenty-four or thirty-six hours a concentrated solution of sulphur in caustic potash. The duration of this bath is about 48 hours, and its temperature is from 35° to 50°. Finally the wood is immersed for thirty or fifty hours in a hot solution (35° to 50°) of acetate of lead. The process, as may be seen, is a long one, but the results are surprising. The wood thus prepared, after having undergone a proper drying at a moderate temperature, acquires under a burnisher of hard wood a polished surface, and assumes a very brilliant metallic luster. This luster is still further increased if the surface of the wood be first rubbed with a piece of lead, tin, or zinc, and be afterward polished with a glass or porcelain burnisher. The wood thus assumes the appearance of a true metallic mirror, and is very solid and resistant.

Etching Liquid for Steel.

Mix 1 oz. sulphate of copper, one-half oz. of alum, and one-half a teaspoonful of salt reduced to powder with 1 gill of vinegar and 20 drops of nitric acid. This liquid may be used for either eating deeply into the metal or for imparting a beautiful frosted appearance to the surface, according to the time it is allowed to act. Cover the parts you wish to protect from its influence with beeswax, tallow, or some similar substance.

Refrigerator Cars.

At the annual convention of the Master Car Builders' Association, held in Chicago in June last, a committee reported on refrigerator cars after an examination of the productions of thirteen different builders, the cars costing from $600 to $1,200 each. The committee said:

"There are now before the public three kinds of refrigerator cars. The first is a car built on the supposition that all that is needed is a cool temperature. These cars are built on the principle of an ice lined box, with the ends, sides, and roof fitted with ice boxes, no arrangement having been made for the circulation of air or absorption of moisture. The second kind of car is that which provides a cool temperature, and also a circulation of air. The third kind is that which provides a cold temperature, and a constant circulation of air that is pure and dry. Your committee are of the opinion that the last named car meets the want of carrying perishable lading. To make a refrigerator car what it ought to be, it is our opinion that there should be a circulation of dry, pure air; the ice boxes should be exposed on all sides to the car, thus getting the cold radiation from them and allowing the air to circulate freely around them; the drainage should be perfect, so that the water would not slop over and spoil the freight; the cooling properties of the water should be utilized before escaping from the car. We think that the car should be built longer than the ordinary box car, so that after taking up space for the ice chambers, etc., there would still be room for a full car load of freight. We would also say that the insulation should be as nearly perfect as possible."

New Photo-Electric Apparatus.

A new photo-electric apparatus, by M. Londe, is intended to make proofs in regular and mathematical order for medical investigations. A doctor desiring to study the different phases of an epileptic attack takes a dozen portraits of the patient, each portrait having the same lapse of time. This is obtained by means of an ordinary metronome, such as is used by students in music to measure time correctly. A steel bar is placed at the axis of the pendulum, to which is attached two needles which dip into a mercury bath at every oscillation, thus allowing the current to pass slowly or rapidly according to the wish of the manipulator. The current turns a disk in the camera, which contains nine lenses, and each lens is uncovered and exposed in a regular manner.

A Town almost Destroyed by a Waterspout.

After a heavy rain and thunderstorm lasting nearly all night a suburb of London, Ontario, was, on the morning of July 11, almost wholly destroyed by a sudden flood caused by the bursting of a waterspout, or by a "cloud burst," several miles up the valley of the Thames. The heavy storm had passed away and all was still, when the roar of the water was heard by those who remained awake at about two o'clock in the morning. Alarms were made and most of the people escaped; but the water rose so rapidly that the overflow of more than twelve feet above the spring floods swept away or undermined two hundred dwellings and other buildings and destroyed about fifty persons. The damage to property is estimated at $500,000.

New Process for the Extraction of Fish Oil.

The fish is sprinkled with 5 per cent of its own weight of ferric chloride or sulphate solution (45° B.), and can then be kept three or four days without undergoing alteration. It is then crushed, made into a paste, and pressed, when a large quantity of water and oil is forced out. The cake from the press dries readily, becomes friable, and is easily pulverized. A further quantity of fatty matter may be obtained from it, either by pressing between heated metal plates, or by extraction with benzine or carbon bisulphide. The residue forms an excellent fertilizer.—*Pharm. J. Trans.*

Paper Mills in the World.

It appears from statistics that there are in the world no less than 3,985 paper mills, producing yearly 959,000 tons of paper made from all kinds of substances, including rags, straw, and alfa. About one-half the quantity is printed upon; and of these 476,000 tons, about 300,000 tons are used by newspapers. The various governments consume in official business 100,000 tons; schools, 90,000 tons; commerce, 120,000 tons; industry, 90,000 tons; and private correspondence another 90,000 tons. The paper trade employs 192,000 hands, including women and children.

THE proportion of doctors to population is given as follows by the *Siglo-medico:*

France	2·91 per 10,000.
Germany	3·21 "
Austria	3·41 "
England	6 "
Hungary	6·10 "
Italy	6·10 "
Switzerland	7·06 "
United States	16·24 "

M. HERVE MANGON, having observed that *Mesembryanthemum crystallinum* takes up from the soil an extraordinary quantity of alkaline salts, proposes to employ it for removing the excess of such salts from land on the sea coast and in salty deserts, so as to make it gradually fit for ordinary vegetation.

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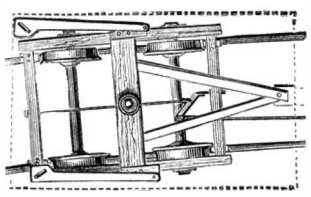
Improved Car Truck.

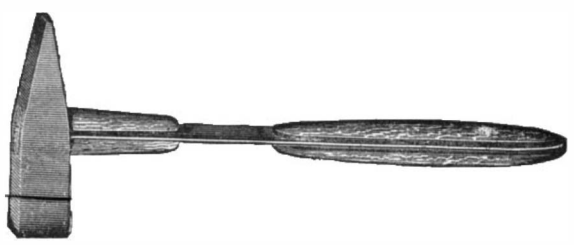
In passing around a curve pivoted trucks always change position relatively to the longitudinal center of the car, and as the outer wheels crowd against the outer rail, their tendency is to cross it or "jump" the track. This is especially the case in curves having a short radius. By means of the slotted side bars shown in the engraving this is prevented, as they limit the movement of the trucks on their pivots, or, in other words, allow them to assume only such angles to the longitudinal center of the car as is compatible with safety.



This angle is approximately indicated when the cross beams or bolsters of the truck are at right angles to radii of the curve, and should the wheels on one side of the trucks meet a surmountable obstruction, the slotted bars tend to prevent the trucks being turned crosswise of the track. As a further means for keeping the trucks in proper position on the rails, a V-shaped frame and link are employed. The bars composing the V-frame are rigidly attached to the swinging bolster near its ends, and the link is pivoted to the apex of the angle formed by these bars and to a frame or piece of lumber or iron which extends across the base frame of the car. When the trucks turn in running curves, the V-frame and link will serve to hold them within the limits of safety. This invention has been patented by Mr. Horace Resley, of Cumberland, Md.

Improved Hammer Handle.

The hammer shown in the engraving is provided with a spring handle of peculiar construction, which not only enables better and truer work to be done, but saves muscle and nerve, while admitting of more rapid work. The spring handle, as will be seen by reference to the cut, consists of a flat steel spring riveted in the hammer head and supported by two wooden keys, which extend a short distance down the spring. The handle proper is formed by riveting to the spring two wooden half handles with an interposed strip of leather.



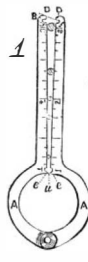
Spring Hammer Handle.

The chief advantages of this handle are that it enables the user to deliver more powerful blows, while rendering the labor lighter and pleasanter. It is very strong and not liable to break, and there is no danger of the head coming off. The hammer provided with this handle is adapted to the use of all mechanics, for heavy as well as for light and medium work. The handle is applicable to all forms of hammers and can be used on all tools with which blows are struck.

Any further information in regard to this invention may be obtained by addressing Messrs. Paul Forchheimer & Co., 38 Park Place, New York city.

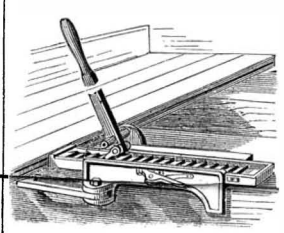
Improved Calipers.

The calipers shown in the engraving are for ascertaining the circumference, area, and weight of bars, rods, balls, etc. They are formed with two curved pieces, which are pivoted to each other, and are provided at their free ends with shanks, the inner edges of which are in radial lines drawn from the center of the pivot uniting the two curved pieces. If the diameter of a rod or bar is taken between the base ends of the shanks, the points of the shanks will show the circumference, or fractions thereof, of the said rod or bar. These calipers can also be used to ascertain the weight of bars, rods, tubes. On the free ends of the pieces, A (Fig. 1), shanks, B, are formed, the inner edges of the shanks being on radial lines from the center of the pivot by which the two pieces are pivoted to each other. Notches, *a*, are formed in the inner edges of the shanks, B, at this base, and notches, *b*, are formed in the inner edges of the shanks at the upper ends. The outer prongs formed by the notches, *b*, indicate the circumference of bars, etc., the diameter of which is taken between the shanks at the lower prongs, *e*. The shanks are provided with a scale used as a gauge for rods bars, etc., to measure the diameter, and for the purpose of ascertaining the area in square inches of a cross section of rectangular bars. The calipers shown in Fig 2 have short, tapering shanks, each of which has a V-shaped notch, *n*, in its inner edge, near the base, which notch has its sides at an angle of sixty degrees, so that the notch can be used as a gauge for grinding the edges on tools, for threading screws, etc. The ends of the shanks of the calipers shown in Fig. 2 are flattened and pointed, and are provided with a transverse mark, *o*, which shows three-eighths circumference of a bar or rod held between the bases of the shanks. At the ends of the shanks one-half circumference is shown, and at the lower corners, *l*, formed by the notches, *n*, one-third the circumference is shown. This invention has been patented by Mr. Andrew Nimmo, of Bristol, R. I.



New Floor Plank Clamp.

The engraving shows an improved device for pressing floor planks together before nailing them to the beams. The device consists of a frame containing a sliding rack plate, the end of which can be pressed against the edge of the end plank by means of a pivoted lever having a pivoted pawl engaging with the rack. The frame is provided with two laterally swinging arms having prongs which can be driven into the beam for holding the frame in place, and the frame is also provided with a pawl lever for automatically locking the sliding rack plate in place on the frame. This useful invention has been patented by Mr Grafton H. Duvall. For further information address B. Thomas, 117 Market St., Philadelphia, Pa.



A Novel Experiment in Silk Weaving.

That hand loom weaving is doomed is a fact too well known to require any further remarks. There is less of it left in England than abroad, though many people would be surprised to hear of the number of hand looms still going in this country, and we fear we should run the risk of being put down as, we will say, inventors, if we stated how many hand looms are still working on cotton ginghams within a radius of say five miles from our offices. But the greatest number of hand looms in Great Britain is running on some special classes of woolen goods, on carpets, and on silks, though all these are extensively made on power looms.

The perfection to which power looms have now been brought have made it not only possible but profitable to produce almost any kind of textile fabric on them, and their introduction abroad, though now not so rapid as some years ago, is making steady progress.

A branch of the trade which has long resisted the introduction of the power loom is the silk industry, partly, says the *Textile Manufacturer*, because the more costly material could afford to pay higher wages, and partly because the better classes of silks required such care in weaving that a power loom could only run at a slower speed, and thus, considering its expense, lose much of its advantage to the manufacturer. Plain silks have for years been woven on power looms in this country and abroad, but goods which required several shuttle boxes, a shaft machine, or a jacquard, could still hold their own on the hand loom. But even this stronghold is being assailed, and nowhere more vigorously than in its citadel, the town of Lyons, whose very existence is almost bound up with the silk trade.

Power looms have for some time been at work in several establishments of Lyons, but their extension has met with a difficulty which is produced by the very existence of a great number of hand loom weavers. Through the great ramifications of the silk industry at Lyons a considerable number of small masters have sprung up who employ two or more hand looms each in their own dwellings, and work for factors or merchants. These small masters are not the men to go into a mill to work before a loom, and their property, consisting of a certain number of hand looms, is also an item to be considered in any change in the trade. The extension of power loom weaving in the ordinary way means working in mills and the employment of women, and is thus antagonistic to a domestic industry carried on by a large number of small masters whose very existence depends upon the retention of existing arrangements inherited from the past.

Under these circumstances a number of the most prominent silk manufacturers of Lyons have tried to combine the two modes of working, and, as it would appear, with every likelihood of success. Their idea is to retain the hand looms for the present, to supplant them gradually by power looms, but to continue the existence of the small domestic establishments, for which purpose they intend to supply the small masters with power in their own dwellings derived from small gas engines.

To test the matter in a practical way, rooms have been taken in a central situation, with two gas engines, one of half-horse and one of one-horse power. The latter drives six power looms, two with jacquard and four with shafts, while the former gives motive power to four converted hand looms, one with jacquard and three with shafts, and also to a pirn winding machine. This trial has now been carried on for more than a year, and we see in a report of the manager that it has been crowned with every success. The power looms have done what could be expected of them, running from 90 to 180 picks per minute, and producing per day an average of 19 yards of satin, or 19,000 yards per year of 250 working days for four looms, the wages paid being about 3d. per yard. The converted hand looms turned out only about eight yards of satin, but they could be attended to by girls instead of men. To favor the experiment, the gas company made a reduction in the price of the gas, charging only about 2d. per cubic meter, upon which basis the one-horse engine, working 296 days, cost 2s. per day for gas. It is not our intention to reproduce here all the items of calculation of the report in question, which, moreover, is not sufficiently complete for our readers to examine satisfactorily to themselves, but we may mention that the interest of the manufacturing community of Lyons has been sufficiently awakened when we state that during the year this trial establishment has been visited during four hours per day, set aside for that purpose, by 200 manufacturers and over 3,000 operative weavers. It would thus appear that it may be of advantage to supply the small masters with gas engines, and thus gradually to introduce power looms, which meets with so much less difficulty in a town like Lyons, where people live in flats, and where, of course, the houses are larger and stronger and more adapted to the introduction of power than most of the cottages would be with us. The matter is, however, of sufficient importance to be called a complete revolution in the silk trade, and one more significant than many other revolutions which have been originated in the French capital of the silk industry.

Progress of Cotton Seed Oil Manufacture.

Among other interesting statements by Professor Goode, United States Commissioner to the International Fisheries Exhibition, was one that the "sardine" manufacture of Maine was of a yearly value of $825,000, the sardines being young herrings packed in cotton seed oil. At the Cotton Seed Crushers' Convention held in Chicago, June 26, 27, and 28, the president stated that there were 85 cotton seed mills in operation in this country, crushing, the last season, 554,600 tons of seed, and there were exported an average of nearly 13,000 barrels of oil yearly, each barrel having a capacity of forty-five gallons. On account of the complaints of olive oil makers in Spain, the Spanish government had imposed a duty that renders the shipment of cotton seed oil to that country unprofitable. In this country cotton seed oil is largely used for cooking purposes, taking the place of lard. It is known as "olive butter," although no attempt at concealing its actual character is made. At the convention a physician and chemist of Chicago exhibited specimens of cotton seed oil which had been deprived of its natural gluten and paraffine, and was equal to the best lubricating oil, having been tested on sewing machines and on watches. The commercial, domestic, and manufacturing value of cotton seed is rapidly increasing. In 1876 there were only twenty-four crushing mills running in this country; now there are eighty-five, and next season there are to be one hundred and ten, even if the number of those now projected should not be increased.

Manufacture of Date Sugar in Bengal.

The supply of coarse brown sugar or molasses in Bengal is mainly derived, not from the cane, but from the date tree, and the date plantations have, during the last fifty or sixty years, enormously increased over several well known districts—Jessore, Burdwan, Baraset, and Nuddea.

The trees are planted in rows or clumps, and are not grown for fruit, as in Arabia or Beluchistan; but the tree becomes profitable after seven years' growth, and may continue to yield a return for thirty or forty. In the month of October the ryots are seen ascending their date trees, and making incisions on alternate sides, in alternate years, on the lowest branch of the feathery tuft at the top. An earthen pot is placed under each incision, and when the cold nights begin, the liquid flows slowly into the pot beneath, whence it is removed in the morning. The colder and stiller the weather the greater the flow of juice. Rainy weather, such as now and then interrupts the enjoyable climate of the cold season, stops the flow of juice for a time, but the process goes on, with few intervals, between November and March. The juice is boiled down and clarified by means of a coarse weed that grows in almost every tank, and the whole cultivation is highly remunerative. The spaces between the trees in a date plantation are turned to account otherwise, for early rice and for the second crop of mustard. Many substantial ryots own 400 to 500, and even 1,000 of these trees, and the traffic in *goor* or treacle adds life and animation to the interior of Bengal.

Blood at $31.25 per Ounce.

Edward Banks, a colored man, has begun suit in the Sixth District Court, this city, before Justice Kelly, against Dr. Henry J. Garrigues and Charles J. V. Okerberg, for $250, as the value of eight ounces of blood taken from Banks and injected into the veins of Mr. Okerberg. It appears that on February 7 last this gentleman went to bed in a small, close room, blowing out the gas. In the morning he was found insensible. Dr. Garrigues and Dr. Frederick E. Valentine treated him, and at the suggestion of the former the operation of transfusion was performed. The patient recovered, and now Banks, who furnished the material for the operation, claims what he considers a fair compensation.

The Earth more Rigid than Steel.

Professor Sir W. Thomson in his new treatise on natural philosophy is led, by a consideration of the necessary order of cooling and consolidation of the earth, to infer that the interior of our world is not, as commonly supposed, all liquid, with a thin solid crust of from 30 to 100 miles thick, but that it is on the whole more rigid than a continuous solid globe of glass of the same diameter, and probably more rigid than such a globe of steel.

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ENGINEERING INVENTIONS.

Messrs. A. Cameron, of Kalamazoo, and C. E. Russell, of Grand Rapids, Mich., have recently patented an improved car step, which can be lowered quickly to afford easy passage from the ground to the cars. The step can be readily raised or lowered by a person on the platform or from the ground.

A novel car coupler which works automatically is the subject of a patent recently granted to Mr. W. H. Lucan, of Hermon, Ill. The construction of this coupler is such that when the link enters the drawhead it sets the pin free, which drops into place through the link, coupling the cars together without any other attention being required from the brakeman.

An improvement in rotary engines has been recently patented by Mr. Moses Fay, of Townville, Pa. The general features of the engine are the same as those of other rotary motors, but by the arrangement of pockets on the steam wheel, and extending the full width of the spokes which support the wheel, the inventor claims less loss of power by friction than is customary in other rotary engines, and believes it to be specially adaptable for light work.

A car coupling possessing more than ordinary novelty has been patented by Mr. Charles A. Huth, of Maynard, O. The coupling pin is operated by a chain connected to a drum which is made fast to a shaft, the latter being operated by a crank. A spring rod fits into a notch in the drum, which supports the pin upright. When the bumper from the approaching car strikes the bumper of the car carrying the coupling pin, the spring rod is tripped and the pin drops into its place without any attention from the attendant.

Among the recent improvements in car couplings is the patent of Mr. Joseph F. Pryor, of Houghton, Mich. His invention relates to that class of couplings in which an arrow headed drawbar is employed. When the cars are brought together the drawbar enters the drawhead, and there is firmly retained by two pivoted hook jaws, which are forced together by suitable springs. The conical head of the drawbar is brought in contact in coupling with the head of a buffer which relieves the strain on the drawbar in coupling, but at the same time serves to force the head back in its position when coupled.

A revolving railroad car signal, designed more especially to be located on the roof of a caboose or the last car of a train as a safety signal to trains that may be following on the same track, has been patented by Messrs. L. W. Schoonover and J. Afflerbach, of Perth Amboy, N. J. This signal is provided with sides of many colored glass and is revolved by connection with the axle of the truck of the car, so that not only the situation and direction of the train may be determined, but the rate of speed will be indicated by the revolutions of the signal, for the guidance of the engineer of a following train.

MECHANICAL INVENTIONS.

Mr. H. W. Rose, of Westerly, R. I., is the patentee of an automatic feeding apparatus, by which animals are fed at stated intervals by the setting of a clockwork mechanism, the time being regulated at the will of the attendant.

An improved drilling machine has been patented by Mr. James C. Smith, of the Dalles, Oregon. This invention consists of an improved hand power drilling machine contrived for use as a bench or ratchet drill, and arranged for shifting the drill for boring in any position that may be desired.

An improved bottle filling machine has been patented by Mr. William Pearson, of Carson City, Nev. This machine is adapted especially for bottling soda and other gaseous liquids, and is so constructed that one or more bottles may be bottled at the same time with great facility, economizing time and labor.

A useful device for holding a door open in any position desired has been patented by Mr. Thomas B. McCurdy, of Lancaster, Texas. A sliding spring bolt is held in the upper edge of the door, with a curved notched frame projecting from the door frame. The bolt passes into the notches of the semicircular frame and holds the door in the desired position.

Letters patent have been granted to Mr. William F. Burditt, of St. John, New Brunswick, for an improved trip mechanism for harvester rakes. The object of the invention is to provide means by which the operator can cause every second, third, fourth, fifth, or sixth rake to sweep off the gavel, as the condition of the grain may require.

A very efficient screw jack has been patented by Mr. Joseph Heritage, of Warren, Mass. The invention consists in providing the screw of the lifting jack with a ratchet, having its teeth similarly arranged on both sides, so that the pivoted arm for rotating the screw may be reversed for turning the screw in both directions, whereby the jack may be either raised or lowered at the will of the operator.

An improved bran or flour packer has been patented by Mr. Henry G. Hall, of Fayetteville, N. C. The invention consists of plungers for forcing the bran or other ground material into the barrel, bag, or package. Means are provided for effecting the escape of the air from between the particles of the substance being packed, to enable it to pack more closely than is possible by the common methods of packing.

An improved fire escape has been patented by Mr. Paschal P. Ripley, of West Randolph, Vt. The fire escape is constructed with a carriage carrying a rotary shaft having wound around it straps attached to the wall of the building, and provided with a crank, a piston, and air cylinder for retarding the descent of the carriage. The carriage is provided with a windlass for raising the carriage again after its descent.

In making cider it is important that the seeds of the apple should be separated from the pomace before the pomace undergoes the pressing operation. Mr. Joseph Dix Camp, of East Randolph, Vt., has recently patented a simple apparatus for separating the seeds from the apple pomace, and cleansing at the same time the pomace of all impurities by permitting water to flow over it, and stirring the mass as the water flows.

Mr. Gustav F. Sievern, of Pittsburg, Pa., has recently obtained a patent on a new mode of propulsion by land or water, by an arrangement of pulleys and chains, the latter working in grooves on the pulleys or by meshing into cogs in the periphery of the pulleys, as the inventor may find by further experiment to be the best plan for transmitting power.

Mr. William W. Lemmon, of Portersville, Ind., has obtained a patent for an improvement in sewer traps, in which mercury is employed as a seal to prevent the gases from escaping. The trap is provided with a series of dams for preventing the waste of the mercury, these being raised at the center, so that should the mercury be washed over the lower dams it will flow down at the sides, back into the trap.

A fire escape consists of a rope supported by a crane alongside a window, to which rope is attached a sliding block having a friction core and brake. In case of fire alarm the inmate of the building places a strap around his body, under his arms, and around over his shoulders, hitches it to the friction block, swings himself out of the window, and commences to descend, regulating the speed by the brake block. Mr. William Newland, of Brooklyn, N. Y., is the patentee.

Mr. O. M. Allaben, of Margaretville, N. Y., has recently patented a ditching machine. To the middle part of the side bars of the machine frame are attached two bars carrying a roller provided with a pin to pivot the handle of the shovel. The shovel is made with a hinged door at its rear end, fastened by a bolt and catch, with a cord for drawing it up, the bolt to release the door and discharge the soil. The shovel is supported against the resistance of the soil by adjustable brace rods secured by a plate and wedges.

A patent has been granted to Mr. Joseph E. Tynan, of Paterson, N. J., for improved bobbin spindle and support, the object of which is to neutralize vibration of the spindles in spinning machinery, arising from irregularities in the weight and size of the bobbins, and also to provide for thoroughly lubricating the bearing of the spindle. The invention consists further in a spindle supported upon a spring wire and arranged to rock on a center at its mid-length, and having its supports provided with oil passages.

An apparatus for supplying water to farm stock, in which the supply will be regulated automatically, so that waste is prevented, and so that the supply of water will not be cut off in freezing weather, has been patented by Mr. A. G. Lyell, of Hunnewell, Mo. The water passes from the reservoir into a box which is provided with an inlet pipe, and with a valve, which when depressed stops the flow into the box. The water passes from thence into the drinking trough, which is provided with a float, which regulates automatically the flow.

A machine for making auger blanks by rolling in place of producing them by hammering has been patented by Mr. Charles O. Tinker, of Ashtabula, O. The main dies, which are secured to rolls are provided with secondary dies which are removable from the main dies, so that others may be inserted. By this arrangement, together with peculiar clutch mechanism for operating the rolls and bringing the dies to the work, the machine is capable of fashioning rough blanks into finished ones ready for the final process of conversion into finished augers.

A seemingly practical machine for dredging oysters, clams, and other shell fish has been patented by Mr. Edwin Paterson, of Port Washington, N. Y. The dredge is provided with grappling shafts supplied with arms or teeth, and with suitable mechanism for operating the same, and further with a series of brushes for cleaning the oysters while they lie in the grappling irons. When the oysters have once been gathered in the dredge, a derrick on the attending vessel raises the oysters on the deck of the vessel, from whence they are transferred into small boats moored at the side of the vessel.

An electrical pilot car to be run in advance of regular railway trains has recently been patented by Messrs. S. H. Knapp and A. E. Adams, of Danbury, Conn. The object is to signal to the engineer on the approaching train any obstructions on the track, the signal being given by means of a gong operated by an electric motor or battery on the pilot car. The pilot car coming in contact with any obstacle on the track breaks the circuit of electricity, which warns the engineer by ringing the gong and gives him time to apply the brakes before reaching the obstruction.

Mr. Edgar H. Taylor, of Ash Valley, Kas., has obtained a patent for an improved stock gate for railroads. The gate is placed between upright guides which are located on each side of the track, the mechanism being so arranged that the gate will be lowered by the depression of the rail when the locomotive passes upon it, and will be raised again by weights when the engine passes off from the movable rail after passing the gate. It will be observed from this that the action is entirely automatic, and that the escape of stock and cattle from field to field by way of the track is thus prevented.

Mr. J. E. Fellers, of Burlington, Ind., has patented an improved grain tally, which consists of a small case adapted to hook on the end of the grain spout of a thrashing machine, or other spout through which grain is to run, the case having a passage through it that is divided into two branches, and contains a gate or valve for turning the grain into either branch at will. To the gate a recording device is connected, so that when a measure is filled under one branch and the operator shifts the valve to turn the grain into an empty measure under the other branch, a record will be made of the filled measure.

Mr. Thomas Watson, of Paisley, County of Renfrew, Scotland, is the inventor of an improved spinning machine, the object of which is to provide means whereby a spindle used for spinning yarn or thread may be given a limited degree of elasticity, in order that any tendency to eccentricity from oscillation under great or varying speed may be avoided. The same inventor has further patented a combined bolster and step for spindles, this step being so formed with radial edges that it may serve as a scraper to clean from the lower end of the spindle the sediment of oil and the particles of grit which otherwise become embedded in the spindle or step, and cause so much friction and wear. Both of the above inventions have been assigned to Messrs. James and Peter Coats, of the celebrated Ferguslie Works, Paisley, Scotland.

An improved floor clamp for pressing together the boards when laying a floor has been patented by Mr. Squire Raymond, of East Venice, N. Y. This implement consists of two parallel bars provided with points and pivoted at one end to a crossbar, and connected at the other with a screw by means of which the parallel bar is clamped to the floor beams. A beam passes between these two bars, and is connected with them firmly, and the lever for pressing the boards together is attached to this beam. An immense amount of power may be given to the lever by applying weight or pressure to the upper end of the beam. A toothed arm provided with a spring is attached to the beam on the opposite side from the lever, for holding the lever to a constant pressure while the board is being nailed.

Mr. Fred. G. Riley, of London, England, has obtained a patent for an improved corking machine in which the whole operation of filling and corking the bottle is performed automatically. All the motions necessary for working the different parts are obtained from a rotary disk, which is mounted upon a horizontal shaft, and is driven by either hand or other power. When a sirup pump is used, as is the case with aerated liquids, a device is provided for warning the attendant when the delivery valve is not working properly. This machine is adapted for use with bottles for non-aerated liquids closed by means of corks, and for bottles for aerated liquids closed with either corks or self-closing stoppers.

An improved steam and water heat radiating apparatus, which is designed for heating a room more rapidly than is possible with the ordinary radiator, has been patented by Mr. Ludwig Crusius, of Kaiserslautern, Bavaria, Germany. The new radiator has a partition which divides the radiator into two compartments, of which one is for steam and the other for water. These compartments have a common inlet cock and separate outlet cocks, whereby if all the cocks are open the apparatus will operate as an ordinary steam radiator; but if the cock of the water compartment is closed the water of condensation accumulates, and is heated by the steam in the adjoining compartment. The steam in one compartment heats the room very rapidly, and the heated water in the other compartment retains the heat and graduates the falling temperature.

AGRICULTURAL INVENTIONS.

Mr. Charles C. Coleman, of Honolulu, Hawaiian Islands, is the patentee of an improved cane planting machine, which is so constructed that when drawn over the ground to be cultivated, the furrow will be formed, the seed plant deposited in the furrow, and then properly covered, the whole being accomplished by one operation and in a very effective and satisfactory manner.

Mr. James Y. Payton, of Ipava, Ark., is the patentee of an improved harrow. The X-beams constitute the toothed part of the harrow, to which a tongue is attached front and rear, in such a manner that the harrow may be drawn either way, with an open angle to the front, in order that the wear of the teeth may be alike, and so that the open angle at the front of the harrow will gather in the clods to the center, and the rear side will spread them out again, making a double action, and thus increasing the pulverizing effect.

An improved trip gear for harvester rakes has been patented by Mr. Walter A. Osborn, of Owosso, Mich. The invention consists in an automatic trip device to be set for permitting any desired number of rakes to pass over and sweep off the gavel, while the rest are allowed to pass over the gavel without doing any work, by which device the due measure of grain will be accumulated upon the gavel. The machine is further provided with a device for disconnecting the trip gear to allow the gavel to be carried any distance before being discharged.

An improved grain thrasher and separator has been patented recently by Mr. William L. Muller, of Muscoda, Wis. The grain is first passed under the thrashing cylinder, which is made similar to but much heavier than those commonly in use, after which it is carried on to the separator, where it is brought under the action of the rotating beater, the straw being carried by the separator into a waste receiver, while the grain falls through on to an inclined apron, where it is subjected to a blast from the fan blower, by means of which it is thoroughly cleansed of all chaff and impurities. The machine is mounted on wheels, so that it may be transferred from place to place.

Mr. Robt. Griswold, of Woodey, Kas., has recently received two patents for important improvements in agricultural machinery. An elevator for unloading and stacking loose hay or grain is the subject of one patent, and as it is a marvel of simplicity and cheapness, it will recommend itself strongly to farmers in need of such an implement. The second patent is for a hay and grain rack with separable sides provided with a lining netting secured detachably to the sides by snap hooks and rings, so that the sides can be removed and the netting connected with an elevating mechanism, to enable the entire load to be taken off in a body. The rack can be mounted on the running gear of an ordinary farm wagon.

MISCELLANEOUS INVENTIONS.

Mr. John H. Burrage, of Concord, N. C., is the patentee of a beehive which is an improvement upon a patent granted to Mr. L. J. Diehl, in December, 1873. It is claimed that by this invention improved accommodation will be afforded to the bees, and that the brood chamber and comb frame are of a more convenient form than those of ordinary construction.

Mr. Geo. W. Bowers, of Somerville, Mass., has obtained a patent for a very simple necktie fastener which is not only inexpensive to manufacture, but is calculated to attach scarfs and neckties to the collar band in a secure manner.

Mr. Silvio E. Massari, of Columbus, O., has patented a very simple vegetable slicer. Near one end, a screw enters the vegetable to be sliced, which causes the knife, as it is revolved, to follow up the cut in a spiral and continuous manner.

Messrs. Amos T. Fox and Daniel T. Fox, of Mt. Pleasant, Pa., are the patentees of a device for turning music leaves. This consists in a wire frame pivoted to the music board and having cords connected with it, by means of which the fliers which hold the leaves are turned by working a foot treadle.

Messrs. R. Neumann & Co., of New York city, by assignment from Mr. Robert Flocke, have received a patent on a lock for satchels and hand bags. The invention relates to that class of satchel locks that hold the handle rings, suitable clips being employed for holding the rings upon the upper side of the lock plate.

Mr. Cæsar Simis, of Brooklyn, N. Y., has patented a novel hat or cap lining, the object of which is to provide such a lining that a mirror or comb can be held in a hat lining in such a manner that they cannot ordinarily be seen when the hat or cap is removed from the head.

A clothes pounder operating on pneumatic principles has recently been patented by Mr. Gordon C. Dimock, of Madison, Neb. The pounder has a cone-shaped metal air chamber which collects and forces the air down into the water and through the clothes, cleansing them in a most satisfactory manner.

Mr. Albert R. Hancock, of Lincoln, Neb., has recently patented an improvement in metal lathing, which can be applied to either wood or metal joints, and is especially suitable for fire proof buildings. The lathing plates are slitted and bent back to form projections for holding the mortar in a manner, it is claimed, superior to metal laths now in use.

An improved rasp, designed for coarser and more effective work than the ordinary rasp, has been patented by Mr. Samuel T. Harrison, of San Francisco, Cal. The ridges of the rasp are formed by being punched out from the back, and should they become worn or dulled by wear, they may be punched out again. The rasp is forged with the tang and body in one piece.

An improved scaffolding for use of painters, builders, etc., has been patented by Mr. Wm. A. Gillett, of Union City, Pa. This scaffolding may be attached to a ladder or other support, and its height regulated to meet the requirements of the workman. It is a useful appliance for all persons having to work on the outside walls of buildings.

Mr. William B. Lyon, of Pontiac, Ill., has obtained a patent for an implement for cutting the two main ligaments on the upper side of the snout of a hog to prevent the hog from rooting in the ground. This operation inflicts no permanent injury upon the hog and is quite effectual in its object. This invention is an improvement upon a patent already granted to same inventor in October, 1881.

An improved sand band designed to be applied to thimble skein axles has been patented by Messrs. Delos M. White and Jonathan Hitchcock, of St. Paul, Minn. This band or collar is made in two equal parts, and is so formed that four chambers will be provided into which the dust will collect and be retained instead of passing into the space between the journal and its bearing, where it would cause friction and wear.

An improved end gate for a wagon has been patented by Mr. Don Juan Arnold, of Brownville, Neb. This invention consists of an improved contrivance for securing the end gate, so that it may be readily let down to be used for a scoop board for shoveling out the contents of the box, this contrivance being so constructed that the end gate may be readily taken off and put on, and securely fastened when applied to the rest of the box.

An improvement in the method of manufacture of finger rings and other articles of jewelry has been patented by Mr. Henrich Heinrich, of New York city. This invention facilitates the ornamentation of finger rings by inserting separate side pieces having grooves on the inner side for receiving the shank of the ring, and grooves on the outer side for inserting ornamented strips, which are made separate from the shank of the ring.

Mr. John A. Moore, of Cambridgeport, Mass., is the patentee of a simple contrivance for holding the mustache from the mouth during meal time. The appliance consists of a small comb, to one side of which is attached a spring hook. The lower portion of the mustache rests upon the comb, and the spring hook engages with the upper portion, so that the mouth is free to receive food without its coming in contact with the mustache.

Mr. Frank R. Siltz, of Leon, Iowa, has obtained a patent on a ventilator for windows or doors consisting of a wind wheel confined in a case, one side of which is covered with wire netting, and the other with a hinged cap which is flung open by a spring when desired. Sliding plates on the cap allow the admission of more or less air, and the wire netting prevents the admission of dust.

Messrs. Gasper Renick and James A. Curtis, of Greencastle, Ind., have patented some improvements relating to two wheeled vehicles. The invention relates principally to the construction of the elliptic side springs for supporting the body, these being connected at the middle to the axle, and having an extension of the upper member beyond the front end of the lower member, these members being connected by a shackle allowing longitudinal motion of each with relation to the other, whereby the backward and forward swing of the body of the wagon from the action of the horse on the shafts will be avoided.

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TO RAILWAY COMPANIES AND OTHERS, requiring data concerning Water, Steam, Air, or Oil, in Pipes, or other reservoirs, when under pressure, also RECORDS OF SPEED of *Machinery, Railway* trains, Dynamos, etc., etc. EDSON'S SPEED and PRESSURE RECORDING GAUGE, and ALARM APPARATUS. A *Railway* and *Steamship Appliance* for securing greater safety to human life. The SPEED APPARATUS connected underneath the "time and pressure recording and alarm gauge." is specially adapted for factories, mills, etc., where the maintenance of any definite rate of motion is required. Upon Railways and Steamboats where Economy, Safety Time, and Speed should receive special supervision, and where every possible protection is demanded by the entire community against the results of *ignorance, carelessness, and recklessness*, such a sleepless watchman as this ingenious device is, is practically indispensable. It is obvious that charts automatically traced, which contain evidence of the rate of speed of a train, or the rate of motion of *machinery*, and whereon the degrees of steam pressure carried are also written, and which define the clock time occupied for any given performance, offer a *combination of evidence* at once impartial and exceptionally complete and incontrovertible; and must in all future time be of great practical value to inspectors and owners of boilers, travelers, and the public in general. The "Records" may be secured against tampering by a band and lock when desired. The apparatus, patented in America and England, is the invention of Mr. M. B. Edson, 77 Liberty Street, New York, who is the sole manufacturer, and to whom applications for information or pamphlets must be made.

For Sale.—The rights for foreign patents in a first rate profitable new invention. Patent allowed here. Thomas Hill, 48 Railroad Avenue, Jersey City, N. J.

You can buy a good Patent for Hop Growers, reasonable. Address Jacob Engle, Jr., Sharon Center, N. Y.

For Sale.—One-half or whole interest in Candian patent that has netted inventors with $500 capital $50.000 in six years in the U. S. Reason for selling, no time to develop Canada. To verify above statement, books open for examination. Address, with references, Edward Taggart, Grand Rapids, Mich.

Wonders in Electricity, 168 pp., $2. Latest and best book. All electrical books. College Electrical Eng., N. Y.

Best Popular Science Works, 15 cents each. Catalogue free. J. Fitzgerald, 20 Lafayette Place, New York.

Wanted.—Boat builders or capitalists to apply and practically test a new canal boat propeller. Address F. M. Marquis, Bellefontaine, O.

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

American Fruit Drier. Free Pamphlet. See ad., p. 30.

Brass & Copper in sheets, wire & blanks. See ad. p. 30.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 30.

Cotton Belting, Rubber Belting, Leather Belting, Linen Hose, Rubber Hose. Greene, Tweed & Co., New York.

Our goods speak for themselves, and a trial will convince the most skeptical of their superiority over all others. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

20,000 Duc Spherical Elevator Buckets, sizes 3½ to 17 inches, constantly on hand. Telegraphic orders filled. T. F. Rowland, sole manufacturer, Brooklyn, N. Y.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Steam Pumps. See adv. Smith, Vaile & Co., p. 30.

Straight Line Engine Co., Syracuse, N. Y. See p. 29.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. More than eight hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

Five foot planers, with modern improvements. Geo. S. Lincoln & Co., Phœnix Iron Works, Hartford, Conn.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address MUNN & CO., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Farley's Directories of the Metal Workers, Hardware Trade, and Mines of the United States. Price $3.00 each. Farley, Paul & Baker, 530 Market Street, Phila.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Railway and Machine Shop Equipment. Send for Monthly Machinery List to the George Place Machinery Company, 121 Chambers and 103 Reade Streets, New York.

25" Lathes of the best design. G. A. Ohl & Co., East Newark, N. J.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Vocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 397.

Curtis Pressure Regulator and Steam Trap. See p. 12.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 14.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 12.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 14.

Lightning Screw Plates, Labor-saving Tools, p. 14.

Soapstone Packing, Empire Gum Core, and all kinds of Engine Packing. Greene, Tweed & Co., New York.

NEW BOOKS AND PUBLICATIONS.

NAVAL BATTLES, ANCIENT AND MODERN. By Edward Shippen. J. C. McCurdy & Co., Philadelphia, Pa.

This is a large octavo of more than 700 pages and containing a large number of illustrations. In a preface the compiler says that the collection is intended to present, in a popular form, an account of many of the important naval battles of all times, as well as some combats of squadrons and single ships. In most instances an endeavor has been made to give the causes and the results of these encounters, and no statement has been knowingly made for which authority cannot be found.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) J. R. M. Writes: I am about to make some experiments in screw propulsion, and would like information on the following: 1. All other things being equal, which has shown the best results, a two, three, or four bladed screw? A. The choice must depend upon size of propeller, velocity at which it is run, and the fineness of model of the vessel. 2. Is there any rule governing the proportion of the pitch to the diameter? A. No. 3. Who is the inventor of the screw most in use? A. There have been many inventors and improvers. Smith, Ericsson, Griffiths, Stevens, etc. 4. What is the best way of making a screw for a model boat, say a screw of 3 inch diameter? A. You may cast it or have it shaped up of sheet copper or brass.

(2) H. M. P. asks: 1. Will increasing the speed of a thrashing engine from 130 revolutions per minute to 175, by enlarging separator pulley, increase power of engine, and will it save fuel? Engine 7 x 12, rated 10 horse. A. It will increase the power of the engine carrying the same steam, but will burn more fuel. 2. Is there any black paint for a boiler that will not injure the iron? A. Black varnish is good, or the "Norwood" smoke stack paint.

(3) A. S. To make one gallon of the paint for a blackboard, take 10 oz. of pulverized and sifted pumice stone, 6 oz. powdered rotton stone (or infusorial silica), ¾ lb. of good lampblack, and alcohol enough to form with these a thick paste, which must be well rubbed and ground together. Then dissolve 14 oz. of shellac in the remainder of the gallon of alcohol by digestion and agitation, and finally mix this varnish and the paste together. It is applied to the board with a brush care being taken to keep the paint well stirred so that the pumice stone will not settle. Two coats are usually necessary. The first should be allowed to dry thoroughly before the second is put on. The second coat should be applied so as not to disturb or rub off any portion of the first. One gallon of this paint will ordinarily furnish two coats for sixty square yards of blackboard. When the paint is to be put on plastered walls, the wall should be previously coated with glue size—glue, 1 lb.; water, 1 gallon; lampblack, q. s. to color; put on hot.

(4) A. J. T. asks how to reproduce faded photographs? A. The following method is simple and in most cases quite effective: Put the card in warm water until the paper print may be removed from the card backing without injury. Hang up the paper in a warm place until perfectly dry, and then immerse it in a quantity of melted white wax. As soon as it has become thoroughly impregnated with the wax it is pressed under a hot iron to remove excess of the latter and rubbed with a tuft of cotton. This operation deepens the contrasts of the picture and brings out many minor details previously invisible, the yellowish whites being rendered more transparent, while the half tones and shadows retain their brown opaque character. The picture thus prepared may then be used in preparing a negative which may be employed for printing in the usual way.

(5) E. P. asks how to produce various bronze tints (or bronzes) on iron, zinc, copper, and brass? A. Dissolve 4 oz. hyposulphite of soda in 1½ pints water, and add a solution of 1 oz. lead acetate in 1½ pints of water. The metals to be colored are placed in this liquid, which is then gradually heated to the boiling point. This treatment produces on clean iron a light steel blue color, zinc becomes bronze, and copper or brass becomes successively red, scarlet, deep blue, light blue, bluish white, and finally white with a tinge of red. This dip has little effect on lead or tin. By replacing the acetate of lead in the solution by sulphate of copper, brass becomes first of a rosy tint, then green, and finally an iridescent brown color. Zinc does not color in this liquid; it reduces and precipitates the copper as a dark brown sponge, but if boiled in a dip containing both the lead and copper salts, it becomes covered with a black adherent crust, which may be improved by coating with a thin wax lacquer. Sometimes these liquids are thickened with gum tragacanth and applied to the plates with a brush to form designs, etc., and the plates are then heated to 212° Fah., and rinsed or plunged into one of the hot baths, by which a variety of effect is produced.

(6) A. Y. F. writes: Please inform me how to make a good enamel for carriage tops. A. Use:

Asphaltum	150 parts.
Boiled oil	3 "
Turpentine	33 "
Benzine	20 "

Melt the asphaltum in the oil and add the thinners.

(7) A. W. H.—Otto of roses is made by distillation. The process is described very thoroughly in articles on page 924 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 58, also on page 390, of SCIENTIFIC AMERICAN SUPPLEMENT, No. 275.

(8) C. P. writes: I have a tin roof, and would like to know if it would be best to paint it. If so, what kind of paint shall I use? A. Paint your roof with red oxide of iron, or Prince's metallic paint and boiled linseed oil. No turpentine. It is a strong, durable paint for outside work.

(9) J. H. M. asks: Will you please tell me through the SCIENTIFIC AMERICAN what paper lagging is put on to iron pulleys with? A. Roughen the surface of the pulley and fasten the paper with rubber cement.

(10) J. G. asks how to compress common salt into a solid mass. A. Melt it, and pour it in suitable forms when in a molten condition. Salt melts at a red heat and is best heated in a covered vessel; and as it volatilizes at a higher temperature, there will probably be a loss of salt.

(11) G. J. E. asks: How can I cement glass and metal? A. Mix 2 ounces of thick solution of glue with 1 ounce linseed oil varnish, or three-fourths of an ounce Venice turpentine; boil them together, stirring them until they mix as thoroughly as possible. The pieces cemented should be tied together for two or three days. This cement will firmly attach any metallic substance to glass or porcelain.

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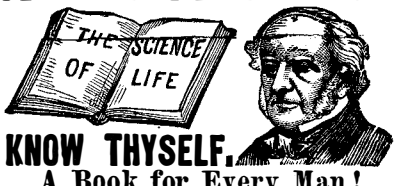

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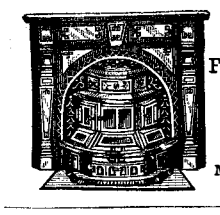

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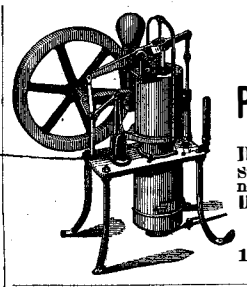

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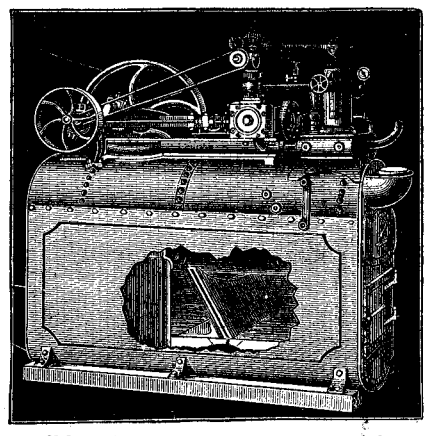

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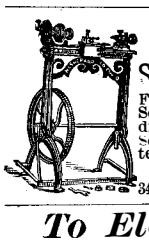

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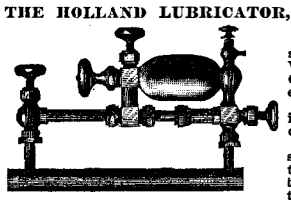

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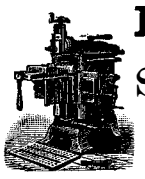

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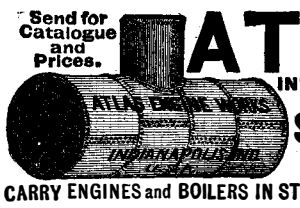

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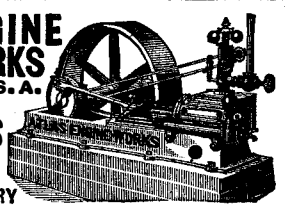

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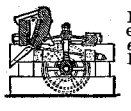

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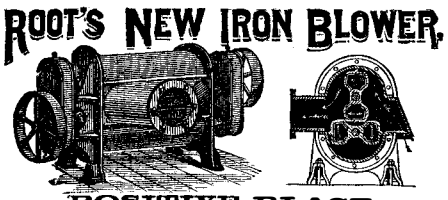

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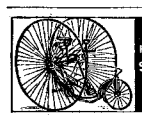

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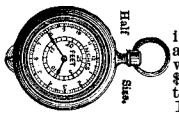

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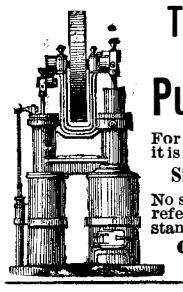

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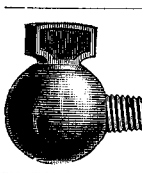

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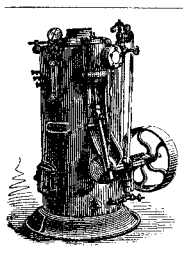

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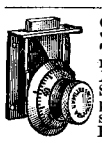

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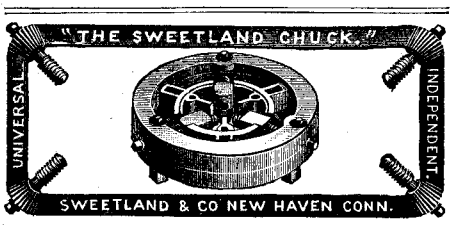

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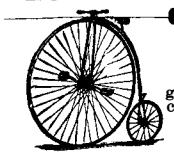

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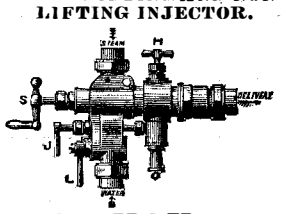

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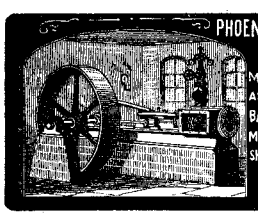
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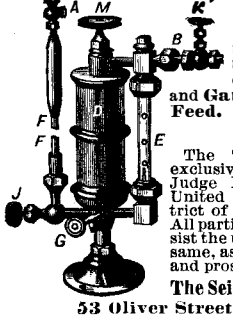

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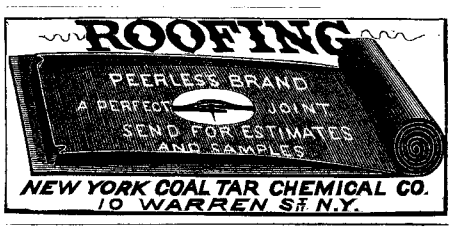

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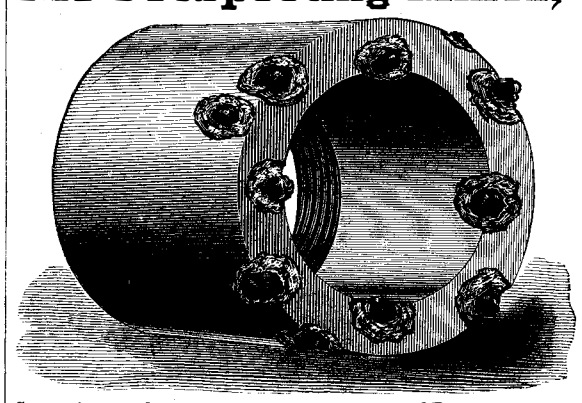

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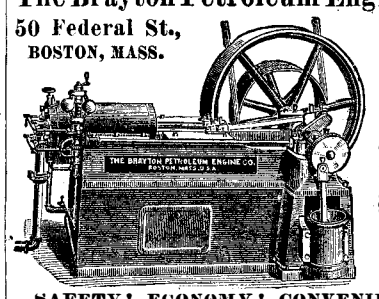

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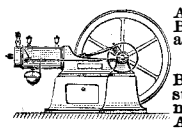

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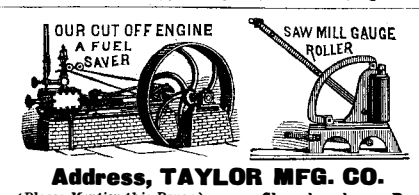

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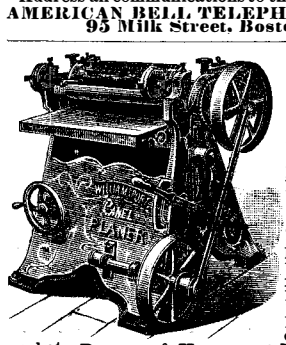

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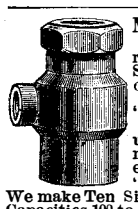

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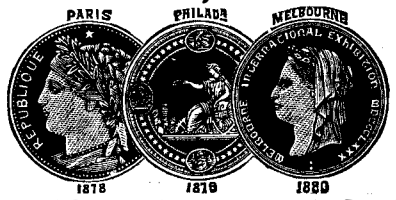

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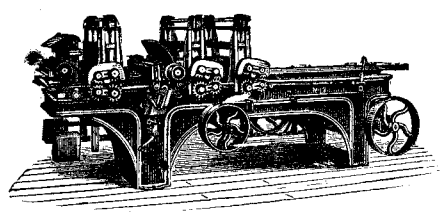

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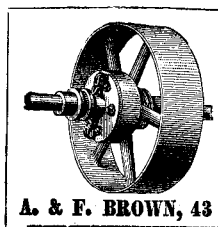

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